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SOUTHPORT.



Messrs. F. Frith & Co. *Photo.*

MUNICIPAL BUILDINGS.

SOUTHPORT:

A HANDBOOK OF THE TOWN

AND

SURROUNDING DISTRICT.

PREPARED FOR THE

MEETING OF THE BRITISH ASSOCIATION

AT SOUTHPORT, 1903.

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PREFACE.

IN offering this Handbook to the Members and Associates of the British Association attending the meeting at Southport, it is hoped that the book will be found of more than temporary interest and value, containing, as it does, a considerable amount of information respecting the History, Meteorology, Physiography, Flora, Fauna, and Antiquities of the town of Southport and surrounding district that has not been previously published.

Thanks are due to the Southport Society of Natural Science, through whose agency were obtained the contributions on the various sections of Natural Science and Archæology. In many branches of Natural History no systematic work has been done in the district, and it has been deemed best to omit all reference to such groups rather than to collate the scattered records of the few species that have been obtained locally.

For the loan of photographs thanks are tendered to Messrs. D. E. Benson, T. L. Bower, H. Brodrick, W. Brunt, J. Culshaw, H. Hillman, and C. Woodall.

The book has been edited by G. W. Chaster, M.R.C.S., G. E. Johnson, M.A., Harold Brodrick, M.A., and F. H. Cheetham.

SOUTHPORT,
August, 1903.

CONTENTS.

Page.

I. SOUTHPORT: HISTORICAL AND DESCRIPTIVE 1

II. SOUTHPORT AS A HEALTH RESORT 26

III. METEOROLOGY 35

IV. GEOLOGY 45

Ribble Estuary 63

V. BOTANY:

(*a*) Higher Flora of the District ... 68

(*b*) Note on Hypopitys Monotropa ... 94

(*c*) Mosses 96

(*d*) Hepaticæ 110

VI. ZOOLOGY:

(*a*) Protozoa—Foraminifera 113

(*b*) Lepidoptera 115

(*c*) Coleoptera 124

(*d*) Araneæ 141

(*e*) Mollusca 146

(*f*) Marine Fauna and Fisheries ... 154

(*g*) Note on the Vertebrate Fauna ... 194

VII. MARTIN MERE 198

VIII. ARCHÆOLOGY 205

IX. LIFE AND WORKS OF THE REV. JEREMIAH HORROX ... 237

SOUTHPORT:

HISTORICAL AND DESCRIPTIVE.



THE TOWN OF SOUTHPORT is situated on that portion of the coast of Lancashire which lies between the estuaries of the rivers Mersey and Ribble. The coast-line is flat and sandy, and presents no distinguishing feature when approached from the sea. Southport stands on the southern bank of the Ribble estuary, the opposite or northern shore being seven miles distant. The town faces the Irish Sea in a north-westerly direction, and from the Promenade may be seen the mountains of Cumberland and the Wyresdale hills of Lancashire. In a south-westerly direction from the Esplanade the Welsh hills, terminating in the Great Orme's Head, are often plainly discernible.

The third degree of longitude west of Greenwich passes directly through Southport. The geographical position of the Town Hall is 53° 38′ 50″ north latitude and 3° 0′ 15″ west longitude. The position of the meteorological observatory in Hesketh Park is 53° 39′ 24″ north latitude and 2° 59′ 3″ west longitude.

The Lancashire coast between the Ribble and the Mersey is bordered by an almost continuous range of

sandhills with a broad belt of level sand of varying extent stretching to the sea. Excepting the sandhills the country round is perfectly flat, the vegetation scanty, and the trees of small size, generally bending away from the sea. Nevertheless this flat country, especially in early spring or late autumn, has a peculiar charm of its own.

Southport is a terminus of the Lancashire and Yorkshire and of the Cheshire Lines Railways. By the former it is in direct communication with the manufacturing towns of Lancashire and Yorkshire, and is connected with the London and North-Western system. Through the Cheshire Lines Railway the town is connected with the Midland, Great Northern, and Great Central Railways.

The beginnings of the modern town of Southport date only from the year 1792, when William Sutton, the founder of the town, opened his hotel on a site now occupied by the junction of Lord-street and Duke-street.

Prior to this, however, portions of the area now covered by the borough of Southport had long been habited, and Churchtown and Birkdale both claim a respectable antiquity. Birkdale, which is still a separate township, is distant from Churchtown some two miles, and it was on this intervening space, formerly a tract of sandhills, that the modern town of Southport came to be built.

The old name of the parish is North Meols. The meaning of the word Meols is not quite clear. Whether it is actually a Saxon word meaning sandhills, as Baines (the historian of the county) states, or whether the word refers, as other writers aver, to the bare appearance of the sand-covered land, will perhaps ever be a matter of dispute; but in either case the word would seem to have some connection with the sandhills which were, and still are, the characteristic feature of this part of the coast.

The name Churchtown—first written as two words—came gradually to be employed in speaking of the

village, as the parish church, dedicated to St. Cuthbert, was situated there.

Southport, it has been said, "began by sea-bathing." But it is probable that had Churchtown been a little nearer the coast-line that the needs of the bathers would have been entirely satisfied in the ancient village. Tradition has it that people came down to the beach to bathe as far back as the days of Queen Elizabeth. However this may be, it is certain that it was the excellence of its bathing that first made the district famous, and visitors used to come in the summer time from the surrounding towns, obtaining such accommodation as was then available at the farmhouses and cottages at Churchtown and the district round. The progress, however, was slow till the end of the eighteenth century, when new energy seems to have been put into the life of Churchtown by the Lord of the Manor (Bold Fleetwood Hesketh, Esq.), to whom in a larger measure than is usually allotted must be given much of the credit for the beginnings of the modern town of Southport.

The most suitable bathing ground lying at some distance from the village, and the inconvenience of journeying to and fro along the sandy tracts being very great, it occurred to one William Sutton, in 1792, to erect an hotel for the accommodation of visitors near to the bathing place itself. Sutton was the landlord of one of the two inns at Churchtown, and had been accustomed to convey the visitors to and fro between the village and the shore. "About the year 1792," says Dr. McNichol, in his Handbook for Southport, "to the amazement, and it would appear to the amusement of his neighbours, he began to build a small wooden house, which, gradually enlarged to very moderate dimensions, became the first inn for the accommodation of the public, under the name of the King's Arms, afterwards changed to the Original Royal Hotel, and which remained till the construction of the new road to Birkdale necessitated its removal. The popular name of Mr. Sutton was 'The Duke,' and it will surprise

no reader that the result of his enterprise, then thought to be in the highest degree romantic, was named the 'Duke's Folly.'" Sutton lived to see the place which he had founded become a thriving village, but died in reduced circumstances in 1841.

The ornamental lamp-post at the west end of Lord-street is a memorial of the enterprising but unfortunate "Duke," and Duke-street takes its name from him.



Geo. Cross. *Photo.*

MEMORIAL LAMP, DUKE STREET.

But the Original Hotel, as it came to be called, was not the first known habitation set up in the district. "This sandy desert," says the first historian of Southport, writing in 1809, "was gradually, if very slowly, being reclaimed by a hardy race, half fishermen, half farmers, who put up rude huts and cultivated patches of ground around them."

Groups of dwellings arose here and there on the open land between Birkdale and Churchtown, one group of

which, known as South Hawes, was nearest to the bathing ground, and came to be absorbed by the new village that sprung up around Sutton's Hotel.

For some years the hotel was closed during the winter months, but in 1798 Sutton took up his residence in the house. At this time a small stream found its way on to the sands close to the hotel, and the sea ran up some distance inland, forming a small estuary. Tradition speaks of a "fine bay of 11 fathoms water, within half a mile from the shore, where vessels occasionally lay securely at anchor." Consequently, says the chronicler, it was a *port* to them in every sense of the word.

Lying south of the village of Churchtown, it was not surprising that at a housewarming given by Sutton in this year (1798), Dr. Barton, of Ormskirk, who presided, facetiously re-named the village South-Port, a name that it has since retained. The stream was named the Nile, in honour of Nelson's victory, which was being celebrated at the same time. The stream is now filled up and its estuary has completely disappeared. The name of the new village continued to be written as a compound word for some years, and so appears in the first edition of Glazebrook's guide, which was published in 1809. In the second edition (1826) it appears as now written.

The modern town thus had its beginnings round what is now the west end of Lord-street. The first houses in Southport were built in this locality, some of which remain. Belle Vue, the residence of Sir George Pilkington, though much altered and added to, incorporates much of the original house erected here at the end of the eighteenth century. A second hotel was built in 1807 on the site of the present Prince of Wales Hotel, and at the same time the first row of lodging houses was erected. Wellington-terrace, immediately opposite Lord-street Station, was built in 1818, and other houses on the same side of the street give some indication of the appearance of the Southport of the early nineteenth century.

Though from this time onward the development of

Southport was rapid Churchtown continued for a long time the more important of the two places. A hundred years ago Churchtown had two constables, one of whom took Southport under his authority.



J. A. Kay. *Photo.*

BELLE VUE.

Though Southport owed its origin to sea bathing the town, unlike most seaside resorts, had its beginnings away from the sea front. Sutton built his bathing house at the end of a long stretch of flat ground, forming a valley that extended from Churchtown towards Birkdale between the sandhills and parallel with the shore. Driving his cart or conveyance daily along this valley in the summer time a cart rut track was soon formed. When houses began to be erected in the vicinity they were naturally built on the sandy ground on each side of this valley. The origin of the great width of Lord-street was thus accidental. Accident, however, was supplemented by the wise foresight of the Lords of the Manor at a later date, who, in 1825, obtained an Act of Parliament which provided, among other things for the

making of Lord-street 88 yards wide. The Lords of the Manor, who thus named the street in "delicate compliment to themselves," were at that time Peter Hesketh, Esq., and Henry Bold-Hoghton, Esq. The name of the street has long been written Lord-street.

In 1843 Mr. Bold-Hoghton sold his North Meols estate to Charles Scarisbrick, Esq., of Scarisbrick Hall, and in 1845 Sir Peter Fleetwood-Hesketh sold the greater portion of his share of the Manor of North Meols to his brother, the Rev. Charles Hesketh, the remainder being bought by Mr. Scarisbrick. Since that date Southport has been owned by the Hesketh and Scarisbrick families. The Lord of the Manor of Birkdale is Charles J. Weld-Blundell, Esq., of Ince Blundell.

The earlier houses in Lord-street were built on that stretch of land which lies between Eastbank-street and the Original Hotel. On both sides of the street the houses had short gardens in front, and when in time Lord-street became a paved roadway the causeway ran close to the gardens on what is now the shop side of the street. This left a large space of open ground between the paved roadway and the gardens on the other side. An open ditch was constructed along this side of Lord-street to act as a drain, and the Lord of the Manor caused the property owners to enclose all the open land on that side of the street right up to and along the edge of his ditch or drain, thus doing away with the vacant waste ground. From this cause originated the long gardens on the south side of the street.

The first house on the sea front was built about 1835, but the development of the Promenade was slow. Coronation-walk (so named in honour of the coronation of George IV.) and Nevill-street were for a long time the only approaches from the town to the shore through the intervening sandhills. More than forty years elapsed between the building of the Original Hotel and the erection of the first house on the Promenade, and it was nearly seventy years after the foundation of the town that the pier was opened.

The Promenade originally ran from Coronation-walk to Nevill-street, and was afterwards extended to Seabank-road. The original sea wall was built perfectly erect and without railing. This sea wall was washed down four times before a more suitable and stable kind of embankment was erected.

In 1846 Southport was formed into a separate and distinct township for the management of its own local affairs, and a Board of Commissioners was appointed for the government of the town.

The progress of the town continued uninterrupted. In 1848 the first railway to Southport was opened, being that portion of the Liverpool line between Southport and Waterloo. It was shortly afterwards extended to Liverpool. The line from Southport to Manchester through Wigan was not opened till 1855. Prior to the opening of railway communication the majority of visitors found their way to the town by means of the Leeds and Liverpool Canal as far as Scarisbrick Bridge, four miles distant, where carriages awaited their arrival to drive them to Southport.

In 1850 the town was first supplied with gas, and three years later the Southport Waterworks Company was formed. The water supply is obtained from deep wells at Ormskirk, about eight miles distant, and is of exceptional purity and practically unlimited in quantity. There are now pumping stations at Aughton and Scarisbrick, and the Waterworks Company is superseded by the Southport, Birkdale, and West Lancashire Water Board.

The Pier was opened in 1860 and extended three years later. Mr. James Brunlees was the engineer.

It was under the rule of the Commissioners that the first idea of the Southport Boulevards took shape, a committee being appointed in 1864 for the purpose of considering the question of planting trees and forming gardens in Lord-street.

The history of Southport naturally divides itself into two distinct portions, the first of which comes to an end with the labours of the Board of Commissioners in 1867.



J. Shaw. *Photo.*

NORTH MARINE PARK AND PIER.

That body had done excellent work, but now the growing importance of the town demanded increased facilities of local government.

In 1867 a Charter of Incorporation was obtained, and since that date the history of the town is very closely identified with that of the Corporation. The immense progress made during the past thirty-five years in Southport is due in no small degree to the enterprise of its governing body.

In 1873 the first tramways were constructed in the borough, and in the following year the Corporation applied to the Local Government Board for their approval of a sewerage scheme, which was carried out at great expense during the following years. The drainage is by gravitation into the sea, the sewer outlet being about three miles north of the town.

The Free Libraries Act was adopted in 1875. The Cambridge Hall, Free Library, Market Hall, Winter Gardens, and other important buildings in the town, noticed later, mark the activity of the town during the earlier years of its corporate life. In 1881 the extension of the Promenade from Seabank-road to Park-road was opened. The Esplanade (which is an extension of the Promenade southwards in Birkdale and which encloses the Recreation Ground and Victoria Park) was opened in 1884, at the same time as the Southport and Cheshire Extension Railway with its station at the west end of Lord-street.

An important step was taken in 1885 when the Corporation completed the purchase of the Foreshore in front of the town from the landowners. The land immediately in front of the Promenade is to have no buildings upon it except for recreative purposes, and thus the open space seaward is preserved for all time. Since the acquisition of the Foreshore by the town the aspect of the sea front has undergone a complete change. The old sea wall and long expanse of sand has given place to gardens and lakes. A small lake was first made on the south side of the Pier, and opened, together with the South Marine Park, in September, 1887. In 1892

the North Marine Park and Lake were opened. Subsequently the two lakes were joined, forming a boating area of nearly forty acres. Across the lake an iron bridge running parallel to the Pier connects the Promenade with the Marine Drive, an outer roadway, opened in 1895, which passing under the Pier joins the Esplanade near the Lifeboat House. The total length of the drive along the sea front from Park-road, Southport, to the Palace Station, Birkdale, is nearly 2½ miles (2 miles 866 yards).

In 1892 the centenary of the borough was celebrated, and in the year following the Corporation adopted a scheme for the electric lighting of the town. A portion of the town was first lit by electricity in November, 1894, and since then the area of electric lighting has been more than once extended. The electrification of the tramways was begun in 1900 and is now completed, the lines of the Southport Tramways Company situated in the borough having been previously purchased by the Corporation. Southport now has probably a greater length of tramways in proportion to population than any town in the kingdom.

Last year on the occasion of the Coronation festivities a scheme of electric illumination of the gardens in front of the Municipal Buildings proved so successful that the Corporation decided to instal permanent illuminations of the same character but on more extended lines. The installation is quite unique in this country, and now forms one of the permanent attractions of the town during the summer months. Special fittings had to be designed, as, being an outdoor installation the electrical conditions are very severe. The installation is divided into five sections, independently controlled, and comprises 4,038 8 candle power glow lamps, mostly pendant amongst the foliage of the trees. The underground and overhead cable used amounts to 16¾ miles. The illuminations are used principally in connection with the concerts given in these gardens by the Corporation Military Band.

Great improvements have been effected in Lord-street

since the introduction of the electric tramways, the roadway being widened its whole length and paved with wood. The street, which is a mile in length, may be said without exaggeration to be unsurpassed by any in the kingdom.

The Southport Corporation has control over the Markets, Cemetery, Art Gallery, Free Library, Science and Art Schools, Public Parks and Gardens, Tramways, Gas, and Electric Lighting. Since 1897 it has maintained a public band in the summer months,

By the Redistribution of Seats Bill of 1884 Southport gave its name to one of the Parliamentary divisions of South-west Lancashire The first member for the division was Dr. (now Sir George) Pilkington, elected in 1885. From 1886 to 1898 the seat was held by the Hon. G. N. Curzon (now Lord Curzon of Kedleston), who resigned it on his appointment to the Viceroyalty of India. Southport has since been represented in Parliament by the late Sir H. Naylor-Leyland, Bart., and Sir George Pilkington (a second time). The present member is Mr. E. Marshall Hall, K.C.

The Corporation of Southport consists of a Mayor, ten Aldermen, and thirty Councillors. The town is divided into ten wards, each returning three representatives. Southport has a Borough Bench consisting at present of thirty-four magistrates, and is the head of a County Petty Sessional Division.

The area of the borough (exclusive of foreshore) is 4,233 acres. The area of the foreshore is 6,824 acres—total area within the municipal boundary 11,057 acres.

The population of the borough was—

In 1871	In 1881	In 1891	In 1901
18,084	32,191	41,406	48,083

The estimated population in the middle of 1903 was 49,000. Population of Southport and Birkdale combined in 1901 62,495. Population of Southport and Birkdale combined in 1903 (estimated) 64,000.



LORD STREET, LOOKING WEST.

Photo. *J. Shaw.*

The valuation of the borough for municipal purposes was—

In 1867 .....£ 76,907
In 1887 .....£225,907
In 1902 .....£354,593
In 1903 (estimated) £355,501

Total rate in 1903 3/9 in the £. Poor rate 1/3.

Almost all the lands and properties in Southport and Birkdale are held as leaseholds under the Lords of the Manors. The leases contain definite and more or less uniform restrictions and conditions with regard to building lines, class of property, etc., and to these considerations is in a large measure due the fact that the built up area of Southport and Birkdale is very large in proportion to the population.

Almost without exception houses are built either entirely detached or semi-detached, and with both back and front gardens.

There are practically no slum properties or properties in back streets or courts such as exist in most towns.

BIRKDALE is a township in the parish of North Meols, south of and adjoining Southport (of which it forms a populous suburb). Birkdale Common is a very ancient settlement. Roman coins have been found there. The name was formerly written Breck-en-le-dale.

The Local Government Act came into force in Birkdale in 1863, and the affairs of the township were managed by a Local Board from that date up to 1894, when by the Local Government Act its powers were transferred to the present Urban District Council. The Council consists of a Chairman and twelve Councillors. The township is divided into four wards each returning three members.

Birkdale has a station on both the Lancashire and Yorkshire and the Cheshire Lines Railways. The Free Library Act has been recently adopted, and a Free Library is now in course of erection.

The population of Birkdale was 14,412 in 1901, and the assessable value £85,046.

MUNICIPAL INSTITUTIONS, Etc.

The Municipal Buildings are situated in the centre of the town facing Lord-street, and consist of the Town Hall, Cambridge Hall, Free Library and Art Gallery, and Science and Art Schools.

The Town Hall, originally erected in 1852 has been subsequently added to, and the internal arrangements completely re-constructed. It contains the usual offices for the work of the Municipality, together with a room for public meetings and the Borough Police Court. The original front to Lord-street presents a classic design in stucco, with stone portico and balcony.

The Cambridge Hall was erected in 1874, and was opened by the Duchess of Teck (Princess Mary of Cambridge) from whom it takes its name. It contains a large public hall on the first floor. On the ground floor are situated the Police Offices. The building is in a free Renaissance style, and has a lofty clock tower.

Next to the Cambridge Hall is the Atkinson Free Library and Art Gallery, erected in 1877, the gift of the late Mr. William Atkinson, of Claremont, Promenade. The Library is on the ground floor, and contains about 30,000 volumes. The lending department is divided into two sections, fiction, and general literature. to the latter of which there is free access to the shelves. The Art Gallery consists of a suite of five rooms on the first floor. An annual Exhibition of Pictures is held here in the spring.

The Victoria Science and Art Schools stand at the rear of the Cambridge Hall and Art Gallery and have no frontage to Lord-street. The schools were opened in 1887, and are under the Department of Science and Art and the Board of Education, and are managed by a Committee appointed by the Southport Corporation. The buildings comprise a School of Art, Science Classes, a School of Cookery and Domestic Economy, and also classes in modern languages, and commercial and technical subjects. Evening continuation classes, under the same management, are held in Christ Church Schools.

The Town Hall, Cambridge Hall, Art Gallery, and

Art Schools are all connected by corridors, and together form a handsome and commodious suite of buildings, which can be easily put into requisition for municipal entertainments and functions.

The group of Municipal Buildings, together with the offices of the Manchester and Liverpool District Bank adjoining, though not possessing any conspicuous architectural merit, present a handsome appearance to Lord-street. The space in front is occupied by ornamental gardens.

The MARKET HALL in Eastbank-street was opened in 1881. The buildings consist of a Market Hall, Fish, and Wholesale Market, and are open daily, special market days being Wednesday and Saturday. Together with the yards adjoining, the Market covers an area of over 7,000 square yards.

The CEMETERY is situated at the end of Duke-street, near the boundary of the borough. It was opened in 1865 and has been since enlarged. Land has also been acquired for further extension when needful. In the Cemetery may be seen the memorial erected by public subscription to the memory of the men who lost their lives in the life-boat disaster of 1886.

The GAS AND ELECTRICITY WORKS are situated at Crowlands, Blowick. The Gas Works comprise plant capable of manufacturing 2,950,000 cubic feet of gas per day, plant for the manufacture of sulphate of ammonia, and for the distillation of tar. All places within a radius of six miles from the Southport Town Hall are supplied from the Corporation Gas Works. The price of gas per 1,000 cubic feet is 2s. 8d. in the borough, and 3s. 2d. outside.

The Electricity Works were erected in 1894, and have been from time to time enlarged to meet the increasing demand for electric light, and for power to work the electric tramways.

The system is -Single-phase, high-tension, alternating current. The Voltage at the works is 2,100, which is transformed in the town to 100 and 210 volts, the pressure supplied to consumers. The plant installed is

equal to 2,350 kilo-watts, approximately 4,000 Indicated Horse Power, viz. :—for lighting, 3,000 I.H.P., for traction, 1,050 I.H.P. The average price obtained per unit sold during the year 1902-3 was 4.05d. for private consumers, 1.71d. for public lighting, and 1.69d. for traction. One unit of electricity will light 34 lamps of 8 candle power for one hour.

Public Parks.—The Parks Committee of the Corporation has control over Hesketh Park, three Recreation



J. Culshaw. *Photo.*

HESKETH PARK

Grounds, the Marine Parks on the Promenade, and the "Public Gardens, Trees, and Shrubberies, which have been provided for the use, enjoyment, or recreation of the inhabitants."

Hesketh Park (30 acres) at the east end of the town, was opened in 1868. The land, then merely a waste of sandhills, was given by the Rev. Charles Hesketh, Lord of the Manor, from whom the Park takes its name.

Hesketh Park contains meteorological and astronomical observatories described in another place.

The Recreation Ground is practically a continnation of Victoria Park, Birkdale, though divided from it, both having been formed from land enclosed by the Cheshire Lines Railway in 1884. The Southport Recreation Ground is entered from the end of Duke-street. At the other end of the same street, over a mile distant, is another Recreation Ground or playing field, while a third is provided at High Park, an outlying suburb.



Geo. Cross. *Photo.*

NORTH LAKE.

The Marine Parks lie on each side of the Pier between the Promenade and the Lake. The northern park has a bandstand and large covered shelter, and concerts are given here nightly in the summer months. The Lake is leased to the Southport Boating Co., who provide sailing boats, canoes, outriggers, pair, four, and six-oared boats. There are also three electric launches for con-

veying passengers round the lake. The roof of the boathouse forms a raised platform or view point. A wind-mill is accessory to the task of raising sea-water into a 25,000 gallon tank for the purpose of flushing the sewers and watering the streets.

TRAMWAYS.—There are over fourteen miles of electric tramways in the borough, of which nearly nine miles are worked directly by the Corporation. The remaining lines are leased to the Southport Tramways Co. This mileage is exclusive of the lines in Birkdale, the length of which is nearly three miles. The lines throughout the borough and in Birkdale are worked on the overhead trolley system, the power being supplied from generating stations in Southport and Birkdale.

CHURCHES.

Ecclesiastically Southport is situated in the Diocese of Liverpool. It is divided into nine parishes, and Birkdale into two. The original parish church of North Meols, St. Cuthbert's, still stands at Churchtown, and is a plain structure built in the eighteenth century and since enlarged. It contains four marble tablets in memory of members of the Fleetwood and Hesketh families, one of them by Nollekens. The church being found inadequate to the needs of the parish, Emmanuel Church, in Cambridge-road, was erected in 1896. The building is a fine modern Gothic edifice in brick and stone, designed by Messrs. Preston and Vaughan, of Manchester.

Christ Church, in Lord-street, was the first church built in Southport proper. The original church erected in 1821 was a plain brick structure with a square tower. Enlargements and alterations have since taken place, and in 1862 the present stone facade with tower and spire were added.

The other churches of the Establishment in the borough are Holy Trinity Church, St. Andrew's, St. Phillip's, All Saint's, St. Paul's, St. Luke's, and St. John's, Crossens. Birkdale is divided between the parishes of St. James and St. Peter.

The Nonconformists possess thirty-seven churches and chapels in Southport and Birkdale, of which nine belong to the Wesleyans and seven to the Congregationalists. The spires of West End Congregational Church and St. George's Presbyterian Church form prominent features in Lord-street.

The Roman Catholics have two churches in Southport and two in Birkdale. The original church of St. Marie's in Seabank-road was designed by A. W. Pugin, and opened in 1840. It has since been much added to and altered. The Convent of Notre Dame in Weld-road, Birkdale, is a brick building of considerable architectural merit.

There is a Jewish Synagogue situated in Sussex-road.



J. Shaw. *Photo.*

INFIRMARY.

CHARITABLE AND OTHER INSTITUTIONS.

The Charitable and Benevolent institutions of Southport are numerous and well supported. The institutions are of two classes, those of a purely local nature, and those which are situated in Southport for the benefit of people residing in other parts of the kingdom.

THE SOUTHPORT INFIRMARY situated in Scarisbrick New-road was opened in 1895. Previous to this date the Infirmary had been located for quarter of a century in Virginia-street. The institution dates from 1825 when a dispensary was opened in connection with the Strangers' Charity. The present building was erected at a cost of £25,000 on land given by the Scarisbrick Trustees. There is accommodation for sixty patients in the men's, women's, and children's wards, and in the rooms set apart for special cases.

THE CONVALESCENT HOSPITAL and Sea-bathing Infirmary stands on the Promenade between Seabank-road and Leicester-street. It was founded in 1806 as the Strangers' Charity, and is one of the oldest of Southport institutions. The hospital is a temporary residence for convalescent and debilitated persons whose restoration to health may be effected by "pure sea air, bathing, wholesome diet and rest." The older portion of the present building at the corner of Seabank-road dates from 1853, and is now used as the men's portion of the institution. The new wing was erected in 1883 at a cost of £30,000, defrayed from the surplus of the Cotton Famine Relief Fund, and is a handsome building in red brick and terra-cotta. The institution contains 372 beds, and about 5,000 patients from all parts of the kingdom are admitted annually.

The North of England CHILDREN'S SANATORIUM in Hawkshead-street, was founded in 1860. The present building was erected in 1878, and enlarged in 1892. It has 100 beds, and its object is "to provide a temporary home, good food, nursing, and medical attendance for children who may be recovering from illness." Boys are admitted between the ages of 2 and 13, and girls between 2 and 17. About 1,000 children pass through the institution annually.

The Manchester and Salford District Provident Society's CONVALESCENT HOME is situated in Lord-street West. The number of patients admitted annually is over 700.

The Southport HYDROPATHIC HOSPITAL in School-street was established in 1861 "for the purpose of providing board, lodging, and medical treatment of those who are suffering from any acute or chronic complaints." There is accommodation for 50 patients, and about 700 are admitted annually.

LIFEBOATS.—The Royal National Lifeboat Institution has two boats at Southport. One, a self-righting rowing boat, is kept in the boathouse on the Esplanade. the other, a non-capsizable sailing boat is moored near the end of the pier. Both of the present boats were put on the station after the lifeboat disaster of 1886.

THE Y.M.C.A. has commodious premises in Eastbank-street, and the Y.W.C.A. has a branch in Lord-street, opposite the Drill Hall.

The TEMPERANCE INSTITUTE, in London-street, is the headquarters of the Temperance Society, and has a large hall for meetings and entertainments.

There are the usual social and political clubs in the town, and also clubs for yachting, rowing, golf, cricket, football, and other forms of sport.

EDUCATIONAL INSTITUTIONS.—With the better co-ordination of Education which the new Act aims at securing, there is every facility in Southport and Birkdale for giving to all a complete education. Both townships possess good primary schools, and two excellent higher grade schools, one for girls and one for boys, carry on primary education one step further. To the advantages of climate and the close connection of Southport with the great industrial centres of Lancashire is due the large number of private schools, both preparatory and secondary, which attract boarders from all parts of the kingdom, and have long had a high reputation. Technical and art classes, and University Extension lectures carry on the work of higher education. There are, however, at present, no exhibitions from the primary tenable at the secondary schools. With proper co-ordination the educational

facilities of Southport and Birkdale would compare favourably with those of any town in the kingdom.

The Southport Literary and Philosophical Society, founded in 1880, meets every month during the winter in the Temperance Institute. Its first president was the late Joseph Baxendell, a well-known meteorologist. The Southport Society of Natural Science was founded in 1890, and meets monthly during the winter, and organises field meetings during the summer. There is also a Medical Society, an Art Association, and various musical societies, all of which contribute to a varied intellectual and artistic activity.



Geo. Cross. *Photo*

OPERA HOUSE

PLACES OF AMUSEMENT, Etc.

The Winter Gardens were opened in 1874. They originally included only the Pavilion, Conservatory, Promenade, and Aquarium, with the adjoining grounds. The gardens have had a chequered career, and the aquarium has fallen into disuse, though at the time of

the opening ceremony it was the principal feature of the institution, and Mr. Frank Buckland publicly stated that it promised to be of the highest national importance. The Pavilion was used for theatrical performances till 1891 when the present Opera House facing Lord-street was opened. The Opera House was designed by Mr. Frank Matcham, and is one of the handsomest and most complete theatres in the provinces. The Pavilion is now used for concerts and miscellaneous entertainments.

THE BOTANIC GARDENS are situated at Churchtown, and cover about twenty acres of ground, formerly meadow and swamp. There is a fine Conservatory and Fernery, and a Serpentine for boating. The gardens were opened in 1876.



J. Shaw. *Photo.*

PIERHEAD.

THE KEW GARDENS are situated at the top of Scarisbrick New-road near the boundary of the Borough. There is a small lake and many means of popular amusement are provided.

THE PIER is the second longest in England, being exceeded in length by that at Southend. It claims to be the first iron pier constructed in this country. The original pier, opened in 1860, was 1200 yards long.

Eight years later it was lengthened to 1465 yards, which is the present length of the structure. A cable tramway at the side worked by a stationary engine, conveys passengers the length of the original pier. The new Pavilion near the entrance was erected in 1901, and is used for concerts and entertainments. From the Pier in summer, steamers run daily to Blackpool, and occasionally to Llandudno, Barrow, the Isle of Man, and other places.

In the winter the seagulls are fed daily at the pier head at noon. The meal consists principally of the livers and entrails of fish, and no doubt originated quite undesignedly from the practice of fishermen throwing the offal of newly landed fish into the sea and thus attracting the birds.

The Victoria Baths are situated on the Promenade at the top of Nevill-street. There are ladies' and gentlemen's plunge baths, and about 70 private baths of various descriptions (salt water, fresh water, hot air, and vapour). There are also Russian and Turkish baths. The baths to-day take the place of the open sea-bathing which was once Southport's chief attraction, and were originally opened in a building on the present site in 1839. They were thus one of the first institutions in the country to which the name "Victoria" was given. The present building was erected in 1871.

SOUTHPORT AS A HEALTH RESORT.

By John J. Weaver, M.R.C.S., D.P.H., Medical Officer of Health, Southport.

and

A. V. Wheeler, L.R.C.P. & S., Medical Officer of Health, Birkdale.

SOUTHPORT first began to be known as a health resort about a hundred years ago, when it was visited by numbers of persons from Manchester and the surrounding districts in search of health, quiet, and sea bathing. Although sea bathing in the open air is not now, on account perhaps of the shallowness of the water and the distance of the sea from the promenade, so much taken advantage of as at that time, in all other respects the town has steadily increased its reputation, and at the present time claims to be one of the very first health resorts in the kingdom, and at all events second to none in the North of England. Its fame to-day may be said to depend specially on its pure air, cleanliness, extensive sands, and the general beauty of its buildings, streets, and parks.

The growth of the town in population has corresponded with its growth in reputation. For many years the excess of females in the population has been considerable, though not to the extent current report often asserts, the real excess being seen from the official figures of males and females for the present year, which are 20,227 males to 28,773 females, an excess of 8,546 females over males, or a proportion of 100 males to 142 females.

The following table shows the numbers of males and females at various ages in a given 1,000 of the population at each census for the last three census years, viz.: 1881, 1891, and 1901:—

	1881.		1891.		1901.	
Ages.	Males.	Females.	Males.	Females.	Males.	Females.
Under 5	56·7	57·1	47·7	48·2	43·0	42·6
5—10	49·1	50·3	49·3	46·8	43·0	44·6
10—15	47·0	51·0	47·4	52·3	43·0	44·0
15—20	38·9	62·9	38·6	66·6	40·6	57·8
20—25	35·1	66·6	35·3	68·7	37·4	67·8
25—35	60·9	100·5	59·6	101·0	62·6	106·9
35—45	46·3	73·8	49·4	71·8	54·2	79·7
45—55	33·5	55·0	36·2	57·9	39·5	59·7
55—65	25·4	40·3	25·0	43·3	27·4	44·9
65—75	13·7	22·8	15·5	24·5	15·9	28 2
75—85	4·5	6·5	4·3	8·1	5·1	9·1
85 & upwards	·4	·5	·3	1·0	·5	1.3
	412·0	588·0	409·2	590·7	412·8	587·1
	1000.		1000.		1000.	

Although these figures show a gradual decrease as time goes on in the proportion of young people as against those of maturer age, this fact makes the gradually decreasing death rate of the borough, in spite of the larger proportion of elderly people in the population, really more satisfactory than a cursory examination of the figures, without this consideration, would indicate.

This comparative fewness of young people in our population is explained partly by the fact that in residential towns of the character of Southport, the birth rate of the community tends continuously to fall, with the result that fewer children are annually born in the district, and partly also by the emigration of our young people as they grow up to centres of more active commercial interest, where if less sanitary advantages are obtainable, there is a larger field for their youthful energies.

Two of the most important essentials of a health resort being pure air and pure water, Southport by its position on the sea coast, with its prevalent

westerly sea-borne winds, has great advantages under the first heading, and in the matter of water has an exceptionally pure and practically unlimited supply from deep wells situated at Ormskirk, about eight miles from the borough. The exceptional purity of the supply cannot be better expressed than in the words of Prof. Thresh, of London, who in an analysis and report made last year states that "no purer water occurs in nature," and that "there is not the slightest trace of contamination of any kind." The full report will be found at the end of this article.

The sewering of the town engages the constant attention of the authorities, and every effort is continually being made to keep it up to the most modern requirements. Among the most recent improvements in this respect may be mentioned the adoption of the Reeves system of sewer ventilation along the whole length of the main sewer in the central portion of the town, and Webb's Patent Ventilating Lamps on other main sewers.

In its efforts to check disease, Southport has adopted an exceptionally progressive policy in the compulsory notification of practically all infectious diseases. While other towns are content with the notification of such diseases as smallpox, cholera, scarlet fever, diphtheria, erysipelas, typhoid, and puerperal fever, in Southport measles, whooping cough, and chicken pox are also compulsorily notifiable. Although the notification of such an unusual number of infectious diseases is somewhat costly, it is felt that in a place which claims above all things to be a health resort, every possible effort should be made to stamp out preventible disease. In this connection, it is of interest to record the fact that last year the zymotic death rate of Southport of .64 per 1,000 was not only the lowest on record in the borough, but also one of the lowest rates recorded in any similar health resort in the Kingdom.

Consumption of the lungs, which annually claims so many victims in this country, is also being effectively grappled with in the borough. During the last few years efforts have been made not only in Southport,

but all over the kingdom, to lessen the mortality from this disease, and the result in this locality has been a marked decrease in the number of deaths from this disease, as shown by the figures for the last three years, which were, in 1900, 77 deaths; in 1901, 53 deaths; and in 1902, 40 deaths—the lowest number of deaths and the lowest rate per 1,000 of the population from this disease ever recorded in the borough in one year.

Southport has advantages both as a summer resort, and also as a winter resort. For anyone who likes bright sunshine, boating or yachting on the sea or on the large artificial lake close to the Promenade, cycling on the broad asphalted roads, golfing,—in fact, an open-air life such as is now generally recognised as so beneficial to all, and especially to those who have had to spend much of their business lives in crowded and smoky towns or in badly ventilated warehouses and offices, Southport offers exceptional advantages. In May, the town begins to look its best in brightness and beauty of flowers and foliage. July and August are our hottest months, but even in these months advantage may be taken of the shelter of the trees which have been so freely planted by the Corporation in almost all the streets and roads of the borough, to spend happily and pleasantly the whole day in the open air.

But Southport is essentially a winter resort. Our winters are comparatively mild, and even during rainy seasons the streets very rapidly become clean and dry after a shower by reason of the sandy and porous nature of the soil. Besides these advantages, several of the main streets have almost continuous verandahs, under which shelter may be obtained and exercise taken at all times.

The ailments for which Southport is especially beneficial as a health resort are bronchitis, in either the earlier stages or in a chronic form, asthma, heart disease, early phthisis, nervous disorders of all kinds, and all forms of childrens' diseases.

There are many persons now living in Southport in comparative health and comfort, who twenty or thirty years ago came here on account of some bronchial trouble, and are able to speak in the highest terms of the great benefits received. The milder forms of heart disease and early cases of consumption are almost equally benefitted, the former by reason of the ease by which the patients are enabled in a uniformly flat district, such as Southport, to take reasonable exercise, and the latter by reason of the purity of the atmosphere and the comparative restfulness of the place. Very advanced cases of heart disease or consumption are probably benefitted by no change of residence, and all such cases are best at home among friends and relatives.

The many and various forms of nervous disorders, due in many cases to overwork and exhaustion of the nervous system, are also much benefitted by the bright and cheerful, and at the same time restful, surroundings of a residence in Southport.

From what has been said above as to the general hygienic conditions of the town and district, it may be readily inferred that no place can be more suitable for the bringing-up of children in health and strength. The slight comparative hardness of the drinking water is probably of particular advantage to them in the formation of sound bone. Moreover the great open-air spaces due to the wide streets and roads, and the parks and gardens, both public and private, are of great advantage from a hygienic point of view. It is interesting to record here the fact that rickets, a disease so prevalent among children in our large towns and cities, and characterised by softness of the young bones, is practically unknown in Southport even among the poor. These considerations have greatly increased the advantages offered by the large number of schools, both for girls and boys, that are to be found in the town.

In spite of the fact that the population of Southport of late years has shown, as explained above, that in a given number of persons the proportion of elderly persons is

increasing, while the proportion of younger persons is decreasing—the vital statistics of the borough show a steady gradual improvement. As an indication of recent sanitary progress, it is highly satisfactory to be able to report that last year (1902) the following rates were, with a single exception, the lowest on record in the history of the borough.

(1)—Gross death rate	15·32	per 1000
(2)—Local death rate	13·20	,,
(3)—Zymotic death rate (·57 per 1000 in 1886)	·64	,,
(4)—Phthisis death rate	·82	,,

The adjoining township of Birkdale is geographically continuous with the borough of Southport, and it may be considered an additional residential suburb of its larger neighbour. By its proximity to Liverpool it forms a convenient and desirable place of residence for a large number of Liverpool merchants and manufacturers, of whom its population is largely composed. By its strictly residential character and the entire absence of anything of the nature of manufactures in the district, the comfort and salubrity of the township and the health of the population is maintained at a high standard as is shown by the fact that the local death rate last year was 12·2 per 1000 of the population, and the zymotic death rate was the remarkably low one of ·2 per 1000.

ANALYSES OF SOUTHPORT WATER.

CHEMICAL AND BACTERIOLOGICAL LABORATORIES,
LONDON HOSPITAL, LONDON, E.

REPORT ON SAMPLE OF WATER FROM THE MAINS AT SOUTHPORT.

The analyses appended are—

(1) The ordinary sanitary analysis, and
(2) The results of the complete analysis of the saline constituents.

The former shows that it is a water of moderate hardness, and of exceptional organic purity. In fact no purer

water occurs in nature. There is not the slightest trace of contamination of any kind. The hardness is 19 degrees, and by this I mean that the soap destroying power corresponds to 19 times that of a water containing one grain of Carbonate of Calcium to the gallon. After boiling there still remains in solution a little Carbonate of Magnesium and a trace of Carbonate of Calcium, neither of these salts being insoluble in pure water, together with a little Sulphate of Magnesia; these give a hardness of 5 degrees. The nitrates present are in very minute quantity, and certainly do not exceed more than what corresponds to ·04 grain of Nitric Nitrogen.

There is a difficulty in determining the hardness of this water which indicates the presence of Magnesia compounds, and an exact estimation is impossible. The figures given by me, however, must be very nearly correct, as shown by the results of the mineral analysis.

The second analysis shows that the water contains chiefly Calcium and Magnesium Salts, together with a little Sodium Sulphate and Sodium Chloride. There is no Sodium Carbonate present.

The water is excellent, and its exceptional purity entitles it to the highest rank as a public supply.

JOHN C. THRESH.

Analysis No. 1.

DATA.

RESPECTING A SAMPLE OF WATER FROM THE BOROUGH OF SOUTHPORT.

Labelled: Taken July 16th, 1902.

Particulars of Source: Town's Water, drawn from tap connected to main at 18, Roe Lane.

Physical Examination.

Turbidity: Quite bright. No deposit.

Colour: Bluish tint. Odour: None.

Chemical Examination.

Determinations.	Results in Grains per Gallon.		Parts per 100,000
Total Solid Matter dried at	24·6	....	35·2
Chlorine	1·95	....	2·8
Equivalent to Chlorides (60% Cl.)..	3·25	....	4·6
Nitric Nitrogen	·039	....	·056
Equivalent to Nitrates (17% N.)	·234	....	·336
Nitrites	None.		
Hardness: Permanent, 5 degs.; temporary, 14 degs ; total	19 degs.		
Lead, Copper, Zinc, Iron	None.		
Free Ammonia	0 0000	....	0·0000
Organic Ammonia	0 0000	....	0·0000
Oxygen absorbed at 80F. in 3 hours..	0·0197	....	0·0280

JOHN C. THRESH, M.D., D.Sc., F.I.C., etc.,

Public Health Lab., London Hospital, London, E.

July 31, 1902.

Analysis No. 2.

SOUTHPORT WATER.

Estimation of the Saline Constituents.

The analytical results corresponded to the parts as under : —

	Per 100,000.		Per Gallon.
Calcium Carbonate	17·5	.....	12·25
Magnesium Carbonate.....	7·4	.....	5·18
Magnesium Sulphate	1·75	.....	1·22
Sodium Sulphate	3·25	.....	2·28
Sodium Chloride	4 60	.....	3·22
Sodium and Potassium Nitrate	·35	.....	·24
Silica, etc	·35	.....	·25
Total Solids dried at 180 deg. C..	35·2	.....	24·64

JOHN C. THRESH.

The following table is a brief statement of the Vital Statistics for the year 1902, given in the form in which corresponding statistics are supplied monthly to the Council.

VITAL STATISTICS, 1902.

Estimated Population, Middle of 1902 - - 48,500.

BIRTHS.		DEATHS.				
Male.	Female.	Male.	Female.	Resident more than 1 year.	Resident less than 1 year.	Bad Lives Imported.
479	463	346	397	621	122	103

DEATHS FROM

Seven Zymotic Diseases.	Smallpox.	Measles.	Scarlet Fever.	Diphtheria.	Whooping Cough.	Typhus, Enteric, and Simple Fever.	Diarrhœa.	Cholera and Choleraic Diarrhœa.	Diseases of the Respiratory Organs.	Phthisis.	Violence.	Deaths in Public Institutions.
31	–	7	3	6	5	4	6	–	123	40	18	63

DEATHS OF PERSONS AGED.

0—1 year.	1—5 years.	5—15 years.	15—25 years.	25—60 years.	60 years and upwards.
134	59	32	22	201	295

ANNUAL RATE PER 1000 LIVING.

Births.	Deaths.		Last Year.	Diseases of Respiratory Organs, excluding Phthisis.
19·42	Gross ...	15·32	16·15	2·53
	Local ...	13·20	14·51	
	Zymotic	0·64	1·64	

THE METEOROLOGY OF SOUTHPORT.

By Joseph Baxendell, F.R.Met. Soc.

SOUTHPORT may be said to possess, if we except some few local peculiarities, a climate representing very closely the average for the north-west coast of England. This it owes to its position, less sheltered than some favoured and rather enervating spots on the shores of Cheshire, and Wales, and less exposed than several "bracing" resorts, both in Lancashire and the Principality.

During the summer months, moderate westerly breezes largely preponderate, and hence the temperature at that season is almost invariably pleasantly low, being in fact appreciably lower than at nearly all other English and Welsh health re-orts. This will be seen from the table of comparative mean temperatures on page 39. From October until February south-easterly and southerly winds are more usually experienced, and the sea temperature, so much more equable than that of the land, accordingly exerts during this period much less influence upon the climate of the district than it does during the summer. In April or May easterly airs generally predominate. North-easterly winds, however, are of more rare occurrence at Southport than those from any other direction.

As at nearly all seaside stations August is as warm as July; the minimum of mean air temperature occurs, however, in January.

In May and June relative humidity reaches its lowest point; and with this naturally coincide the maximum epochs of daily range of temperature and sunshine duration. These two months, moreover, are the calmest of the year, whilst December and January, on the average, are the stormiest and most cloudy.

In April the minimum of rainfall is attained. August

and October are Southport's wettest months. The fall throughout the first half of the year is ordinarily light; a striking increase somewhat suddenly takes place shortly after midsummer, and the higher value is, on the whole, maintained to the close of the year.

The average temperature of the air at Southport for the complete year is 48·5 degrees; the total duration of bright sunshine (per Campbell-Stokes recorder) about 1600 hours; and the total rainfall a little over 30 inches. The monthly average comparative statistics of temperature, humidity, and rainfall from other English and Welsh health resorts given in the accompanying tables have been obtained from the official publications of the Royal Meteorological Society, and may therefore be fully relied upon. Unfortunately, similar values for sunshine duration are not available.

The rainfall of the district is materially influenced by the presence of the high Welsh hills to the south-west, in passing over which some of the principal rain-bearing currents are largely drained of their superfluous moisture, and hence arrive at the Cheshire and Lancashire coasts in a relatively dry condition. The rainfall over the Wirral Peninsula of Cheshire is, from this cause, remarkably light for a west coast locality. But as one proceeds northwards the effects of this influence steadily diminish, some of the previously mentioned humid winds ceasing to be subjected to the draining process at all, and come to the central Lancashire coast stations directly off the sea. The following average annual rainfalls for the thirteen years 1890-1902 inclusive, at three reliable stations, show with sufficient clearness the general result:—

	New Brighton.	Southport.	Blackpool.
Mean annual rainfall	27·24 ins.	30·45 ins.	33·71 ins.

One important local peculiarity of the climate of Southport, and of the flat country adjacent, is the cloudlessness, and consequent large amount of sunshine experienced in spring and early summer, more especially during the prevalence of cool north-westerly or northerly winds. There is, it must to some extent be admitted, a

compensating cloudiness of autumn and winter. To the latter condition, however, the delightful afternoons and starlit evenings of September, unequalled locally in any other month, form a very notable exception.

The well-known diurnal alternating land and sea breezes of coasts are frequently strongly developed on the Lancashire seaboard; in fact they form one of the most agreeable and interesting features of the weather of Southport during the spring and summer months, and it is necessary for a land wind to be possessed of some decided strength to enable it to prevail throughout a sunny day. Usually when a light easterly or other air off the country has existed during the night the sea wind replaces it an hour or two before noon, and, rapidly attaining the force of a moderate breeze, then veering gradually to the north of west, it continues to blow steadily until evening, and dies away after sunset. The diurnal maximum of frequency of easterly winds occurs about 3 a.m., and of south-easterly ones about 5 a.m. Westerly breezes are most frequent from 1 to 2 p.m., and north-westerly ones about 3 p.m. Each of the two groups of winds is nearly twice as frequent at its hour of maximum as at its time of minimum.

From causes which it would occupy too much space here to explain, the diurnal range of wind movement amounts on every coastline to a notably smaller percentage of the mean velocity than it does at low-level inland stations. On the average of the year the maximum velocity in the afternoon at Southport is three miles per hour above the minimum in the night.

The maximum of air temperature in fine weather in summer occurs about 2 p.m., but there is often little variation from 11 a.m. to 6 p.m. This comparatively level curve on days of sea breezes, even with the clearest sky, presents a striking contrast to the lofty maxima shown on inland thermograms for sunny days.

The early morning maximum of rainfall duration peculiar to the Atlantic seaboard is very pronounced at Southport, forming, indeed, the principal one for the twenty-four hours, although in summer the continental

afternoon maximum of both duration and quantity is also experienced.

The district enjoys a complete immunity from destructive hailstorms; severe thunderstorms seldom occur; and heavy falls of snow are decidedly infrequent.

SOUTHPORT.

Averages of Sunshine, Wind, and Ozone.

	Total Duration of Sunshine.	Mean Daily Movement of the Wind.	Direction of the Wind at 9 a.m. and 9 p.m. Frequency Percentages.								Mean Amount of Ozone.
			N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	
	Hours	Miles	%	%	%	%	%	%	%	%	0 to 10
January	44	362	6	4	8	25	20	16	16	5	2·6
February	72	301	8	6	11	21	17	16	15	6	2·2
March.....	126	317	9	7	12	17	12	16	17	10	3·7
April	175	320	7	10	19	16	13	11	16	8	3·9
May	232	286	7	9	17	11	11	12	20	13	4·2
June	207	270	5	6	11	11	12	15	25	15	4·4
July	219	291	5	4	7	9	11	18	29	17	4·5
August	195	291	6	4	10	12	14	17	24	13	3·5
September ..	142	309	7	5	11	17	15	15	18	12	3·0
October	96	324	9	8	11	19	17	12	14	10	2·1
November ..	48	322	9	8	11	21	18	13	13	7	1·8
December ..	31	383	8	4	8	23	18	15	16	8	2·5
Year	1587	315	7	6	11	17	15	15	19	10	3·2

Note.—The averages given in the above table are, for sunshine, those for the 6 years, 1897-1902; for wind velocity, those for the 5 years, 1898-1902; for wind direction, those for the 30 years, 1872-1901; and for ozone, those for the 6 years, 1897-1902. The wind velocities have been obtained by means of a Dines Pressure Tube Recording Anemometer, very fully exposed on the coast at Marshside. The sunshine values are those given by a Campbell-Stokes Sunshine Recorder. A longer series of observations, by a Jordan Recorder, show that June is more sunny than July.

COMPARATIVE STATISTICS.

Averages for the 10 Years, 1891-1900.

*Mean Temperature.

Station.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	°	°	°	°	°	°	°	°	°	°	°	°	°
Southport	38·1	39·2	41·4	46·3	50·7	57·7	59·7	59·8	56·0	48·4	44·4	40·5	48·5
Aberystwith ...	40·9	41·9	42·8	47·9	51·9	58·0	60·2	60·7	57·8	51·1	47·4	44·1	50·4
Blackpool	38·3	39·0	41·2	46·6	51·2	58·1	60·1	60·0	56·4	48·9	44·8	40·8	48·8
Brighton	39·7	40·8	43·1	48·7	53·5	59·7	62·8	63·1	59·7	52·4	47·3	42·9	51·2
Buxton	34·7	35·9	38·4	43·7	48·2	55·5	57·9	57·5	53·2	45·3	41·4	37·4	45·8
Cheltenham ..	37·5	39·1	41·6	47·2	51·9	59·2	61·8	60·8	56·1	48·1	44·1	40·4	49·0
Eastbourne	39·5	40·7	42·8	48·1	53·2	59·3	62·1	62·4	58·7	51·7	46·8	43·0	50·7
Falmouth	42·6	43·7	44·6	49·0	52·7	58·7	61·4	61·3	58·5	52·3	48·5	46·1	51·6
Guernsey	42·9	43·6	45·1	49·6	53·5	59·1	62·2	62·7	60·6	54·1	49·5	45·9	52·4
Ilfracombe	42·5	43·2	44·5	49·1	52·5	59·1	61·4	61·0	59·3	53·0	48·9	45·9	51·8
Llandudno	40·8	41·6	43·1	47·7	51·6	58·1	60·5	60·7	57·5	50·5	46·8	43·5	50·2
Lowestoft.....	37·5	38·7	41·0	45·4	49·7	56·5	60·4	60·6	57·4	50·1	45·5	40·4	48·6
Malvern	37·7	39·3	42·1	47·8	52·3	59·6	61·9	61·1	57·3	48·8	44·1	40·3	49·4
Margate	38·3	39·8	42·3	47·1	51·8	58·6	62·5	62·6	59·0	51·4	46·2	41·4	50·1
Newquay	42·8	43·6	44·5	48·7	52·1	57·9	60·8	61·0	58·6	52·3	48·6	46·4	51·4
Scarborough ..	37·8	38·6	41·1	45·1	48·7	56·0	59·1	59·2	55·7	48·0	44·7	40·0	47·8
Sidmouth.....	40·3	41·6	43·1	48·1	52·1	58·2	61·0	61·0	57·9	51·0	46·9	43·7	50·4
Torquay	41·7	43·0	44·1	48·9	53·1	59·3	61·9	61·7	58·6	52·0	47·9	44·7	51·4
Tunbridge Wells	36·8	38·9	41·6	47·1	52·0	58·8	61·7	61·0	57·3	49·2	44·2	39·8	49·0
Ventnor	40·9	42·1	43·9	48·0	53·4	59·2	62·5	62·7	60·0	53·2	48·4	44·4	51·6
Weston-s-Mare	40·1	41·1	43·4	48·9	53·4	60·1	62·2	62·4	59·6	51·3	46·6	43·0	51·0
Weymouth	40·7	41·5	43·2	48·5	52·9	59·1	62·0	62·2	59·2	52·4	47·7	44·3	51·1
Worthing	38·8	40·1	42·2	47·9	52·7	58·7	61·6	61·9	58·5	51·4	46·4	41·9	50·2

*Mean of daily Maxima and Minima.

COMPARATIVE STATISTICS—(*CONTINUED*).

Mean Relative Humidity

at 9 a.m.

Station.	January	February	March	April	May	June	July	August	September	October	November	December	Year
	%	%	%	%	%	%	%	%	%	%	%	%	%
Southport	88	87	83	78	73	75	76	78	81	85	88	88	82
Aberystwith	85	82	80	76	73	78	79	78	80	79	82	84	80
Blackpool	89	88	83	78	73	75	75	79	81	84	87	90	82
Brighton	89	87	81	76	73	76	74	74	75	81	86	87	80
Buxton	91	87	85	77	75	74	76	78	80	85	89	90	82
Cheltenham ..	91	88	84	78	74	75	75	78	83	88	90	88	83
Eastbourne	88	86	82	76	74	76	75	77	78	82	86	87	81
Falmouth	88	85	82	77	73	76	77	78	80	84	86	87	81
Guernsey	89	87	88	87	86	86	86	86	84	86	89	89	87
Ilfracombe	87	85	84	84	81	83	84	82	83	84	85	87	84
Llandudno	83	82	78	76	72	75	75	76	77	79	82	81	78
Lowestoft	90	88	83	79	78	76	74	76	79	84	88	89	82
Malvern	88	86	80	75	71	71	71	76	79	86	89	89	80
Margate.....	91	88	83	79	76	76	74	75	78	83	88	89	82
Newquay	87	85	84	83	81	81	81	82	81	83	86	88	84
Scarborough...	90	89	85	82	81	81	79	81	82	86	90	91	85
Sidmouth	89	86	81	78	74	78	75	77	80	83	88	87	81
Torquay	87	85	79	75	73	73	74	76	79	82	86	86	80
Tunbridge Wells	91	88	81	73	70	71	71	74	80	86	90	91	81
Ventnor	88	86	81	77	74	77	75	77	76	81	84	86	80
Weston-s-Mare	91	89	85	82	80	81	79	81	83	88	89	90	85
Weymouth	88	86	81	80	74	77	76	78	79	82	84	86	81
Worthing	89	87	82	76	73	75	74	76	77	83	87	89	81

COMPARATIVE STATISTICS—*(CONTINUED).*

Total Rainfall.

Station.	January	February	March	April	May	June	July	August	September	October	November	December	Year
	ins.	ins.	ins.	ins.	ins.	ins	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Southport ...	2·28	1·92	1·73	1·65	1·98	2·03	2·19	4·14	3·01	3·96	2·82	3·29	31·00
Blackpool	2 54	2·24	1·87	1·86	1 99	2·33	2·24	4·38	3·12	4·16	3·20	3·59	33·52
Brighton	2 35	1·97	1·75	1·43	1·26	1·72	2·01	2·13	2·47	3·91	3·04	3·00	27 04
Buxton	4·65	3·80	3·65	3·03	3·04	3·52	3·50	4·71	3·83	5·11	3·80	6·39	49·03
Cheltenham ...	2·00	2·02	1·46	1·46	1·74	1·59	1·95	3·06	1·97	2·88	2·42	2·73	25 28
Eastbourne ...	2·44	2 16	1·93	1·57	1·33	1·80	2·62	2·50	3·11	4·31	3·34	3·31	30·42
Falmouth	4·21	3·37	2·66	2·38	1·74	2·07	2·28	3·45	2·73	4·92	4·83	6 61	41·25
Guernsey	2·76	2·10	1·92	1·93	1·71	1·78	2·00	2·37	2·94	4·31	3 53	4·07	31·42
Ilfracombe	3·26	3·16	2·27	2·07	1·99	1·72	2 57	3·92	3·46	5·26	4 01	5·22	38·91
Llandudno ..	2·44	1·95	1·87	1·84	1 97	2·11	2·06	3·27	2·74	4·62	2·91	3·17	30·95
Lowestoft	1·83	1·39	1·40	1·46	1·60	2·07	2·34	2·81	1·58	2·95	2 15	2·06	23 64
Malvern	2·40	1·97	1·44	1·46	2·12	1·85	1·92	2·84	2·10	3·10	2·43	2 95	26·58
Margate	1·78	1·61	1·48	1·08	1·55	1·87	2·13	2·30	1 69	3·01	2·34	2·22	23·06
Newquay	3·44	2·55	1·98	1·96	1·56	1·67	2·30	2·79	2·94	4·21	3·76	4·86	34·02
Scarborough ...	2·29	1·86	1·62	1·41	1·93	2·21	2·34	2·92	1·77	3·70	2·20	2·28	26·53
Sidmouth	2 96	2·28	2·07	1·72	1 62	1 79	2·27	3·19	2 11	3·41	3·47	3 83	30 72
Torquay	2·64	2 16	2·31	1·69	1 70	2 01	2·39	3·16	2 20	4·42	3·88	4·79	33·35
Tunbridge W'ls	2·64	2·23	2·20	1·42	1·54	2·02	2·06	2·33	2·46	4·23	3 64	3·43	30·20
Ventnor	2·60	2·09	1·77	1·46	1·44	1·96	2 03	1·93	2·63	3·94	3 31	2 95	28 05
Weston-s-Mare	2·33	2·20	1·42	1·50	1·62	1·64	2 07	3·38	2 57	3·96	2 59	3 08	28 36
Weymouth ...	2 49	2·09	1·86	1·53	1 34	1·58	1·90	1·88	2·29	3 15	3·43	3·60	27·14
Worthing	2·25	1·91	1·57	1·29	1 16	1·59	2·19	1·92	2·42	3·67	3·17	2 65	25 79

Joseph Baxendell, F.R.Met. Soc.

THE OBSERVATORIES

The nucleus of the Fernley Meteorological Observatory in Hesketh Park, Southport, was presented to the Southport Corporation in 1871 by the late John Fernley, Esq., J.P., of Birkdale. Numerous additions have been made during recent years, and an auxiliary Anemograph Station was established in 1897 on the coast at Marshside. At the present time the Observatory is generally regarded as being the best equipped with modern instrumen's in the United Kingdom. Thirteen self-recording and thirty-nine ordinary standard instruments are in use, a list of which is appended. Special attention is devoted to research and experimental work.

Adjacent to the Meteorological Observatory in the Park is a moderate-sized Municipal Astronomical Observatory used for educational purposes, and containing a 6-inch clock-driven Cooke Refractor and a Transit Instrument.

IN HESKETH PARK are placed:—

SELF-RECORDING METEOROLOGICAL INSTRUMENTS.

I. Dines Mercurial Barograph.
II. Richard Aneroidograph.
III. Dines Thermograph.
IV. Richard Thermograph.
V. Richard Hair Hygrograph.
VI. Baxendell Recording Anemoscope.
VII. Halliwell Recording Rain Gauge.
VIII. Casella Recording Rain Gauge.
IX. Campbell-Stokes Sunshine Recorder.
X. Jordan (twin-chamber) Sunshine Recorder.

NON-RECORDING METEOROLOGICAL INSTRUMENTS.

1. Fortin Barometer.
2. Kew-pattern Barometer.
3. Dry-bulb Thermometer, in Fernley single-louvred structure.
4. Wet-bulb Thermometer, in Fernley single-louvred structure.

5. Maximum Thermometer, in Fernley single-louvred structure.
6. Minimum Thermometer, in Fernley single-louvred structure.
7. Dry-bulb Thermometer, in Stevenson-screen.
8. Wet-bulb ,, ,,
9. Maximum ,, ,,
10. Minimum ,, ,,
11. Public standard shade Thermometer.
12. Black-bulb Solar Radiation Maximum Thermometer.
13. Blackened-bulb Solar Radiation Maximum Thermometer, *in vacuo*.
14. Bright-bulb Solar Radiation Maximum Thermometer, *in vacuo*.
15. Terrestrial Radiation Minimum Thermometer.
16. Sensitive-bulb Terrestrial Radiation Minimum Thermometer.
17. Earth Thermometer, with bulb one foot below the surface.
18. Earth Thermometer, with bulb four feet below the surface.
19. Earth Thermometer, with bulb ten feet below the surface.
20. Earth Thermometer, with bulb twenty feet below the surface.
21. Lake Thermometer.
22. Robinson Cup Anemometer.
23. Dines Pressure Tube Sight-Indicating Anemometer.
24. Wind Direction Dial.
25. Meteorological Office-pattern eight-inch Rain Gauge.
26. Snowdon pattern five-inch Rain Gauge.
27. Underground Water-level Gauge.
28. Evaporation Gauge, in a Stevenson-screen.
29. Moffat Ozonometer.
30. Dew Board.

AT THE MARSHSIDE ANEMOGRAPH STATION are mounted:—

SELF-RECORDING METEOROLOGICAL INSTRUMENTS.

XI. Dines-Baxendell Anemograph.
XII. Dines Pressure Tube Recording Anemometer.
XIII. Halliwell Anemoclinograph.

NON-RECORDING METEOROLOGICAL INSTRUMENTS.

31. Dial-pattern Non-Oscillating Maximum Pressure Plate Anemometer.

ON, AND NEAR, BARTON MOSS, DOWNHOLLAND, there are:—

32. Sensitive-bulb Terrestrial Radiation Minimum Thermometer.
33. Symons six-foot Evaporation Tank.
34. Snowdon pattern Rain Gauge.
35. Brook-level Gauge (in Downholland Brook).

AT BIRKDALE are placed:—

36. Snowdon-pattern Rain Gauge.
37. Underground Water-level Gauge.

IN CHARGE OF THE DIRECTOR AND CHIEF ASSISTANT are:—

38 and 39. Standard-of-reference Thermometers.
A number of duplicate glass instruments are kept in store.

THE GEOLOGY OF THE SOUTHPORT DISTRICT.

By HAROLD BRODRICK, M.A., AND EDMUND DICKSON, F.G.S.

THE geological formations which occur in the Southport district consist of the following:—Millstone Grit, Coal Measures, Permian, Bunter, Keuper, Glacial, Post-Glacial, and Recent.

The great Triassic Plain of Western Lancashire which is bounded by the Irish Sea on the west, the Wyresdale Hills on the east, and the high ground surrounding Parbold Hill on the south and south-east may be regarded as a sector of a circle of which Southport is the centre. It is divided into two parts by the river Ribble, the plain-like character of the portion on the north being indicated by its name, "The Fylde," meaning "the field." To the east and north-east of Southport the division between the Triassic and Carboniferous rocks is well marked, the line of the boundary fault running in a north-easterly and south-westerly direction near Samlesbury, Euxton, Leyland, Bispham, and then in a southerly direction to a point about half way between Rainford and Knowsley.

There are two sets of maps published by the Geological Survey on the one-inch scale—Solid and Drift. Of these the latter is for most purposes the more reliable showing as it does only such formations as actually exist at the surface. As the greater portion of the district is obscured by glacial and post-glacial drift the maps of the Solid Geology are of necessity uncertain in the case of a large number of faults and boundaries.

The Geological Survey has also published maps of the Lancashire coalfields on the six-inch scale; these maps show the drift deposits by shading where they occur, and are therefore of very great use. Several sections have also been published of the coalfields. All the maps and memoirs of the Geological Survey may be seen at the Picton Free Library in Liverpool.

The greater portion of the district has been carefully investigated by numerous writers, many of whom have contributed papers to the Proceedings of the Liverpool Geological Society. Amongst others may be mentioned C. E. De Rance, F.G.S., and Professor Hull, of the Geological Survey, T. Mellard Reade, F.G.S., G. H. Morton, F.G.S., James Heywood, F.G.S., E. W. Binney, F.R.S., C. Ricketts, F.G.S., J. Lomas, F.G.S., and Edmund Dickson, F.G.S.

The literature dealing with the district is fairly extensive, and appended is a list of some of the publications which deal with the geology of the area under consideration.

1. Survey Memoirs.
   (a) The Country round Wigan.
   (b) The Country between Liverpool and Southport.
   (c) The Country round Lytham and South Shore.
   (d) The superficial Geology of the Country adjoining the coasts of South-west Lancashire.
   (e) The Geology of the Burnley Coalfield.
2. The Geology of Liverpool, by the late G. H. Morton.
3. Notes on Sections within 40 miles radius of Southport, by C. E. De Rance. (Geol. Mag. 1883, p. 500).
4. Papers published in the Proceedings of the Liverpool Geological Society.*

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* We should like to call attention to the paper by T. Mellard Reade on the Geology of the Post-Glacial period, as shown in the deposits and organic remains of Lancashire and Cheshire, Vol. 2, p. 36, in which the post-glacial deposits of the neighbourhood are fully dealt with.

5. Papers published in the Proceedings of the Southport Society of Natural Science.

Geological Map.

The Geological sketch map accompanying this volume is based upon the Drift sheets of the Geological Survey: several minor alterations have been made to agree with more recent investigations.

The coast-line is shown as it existed in 1842, the date of the first publication of the survey, and the present coast-line is indicated by a dotted line, great accretions having taken place during the interval. The sandbanks in the Estuary of the Ribble are also shown as they existed in 1842 and in 1895, as very great alterations have taken place, partly owing to the natural sweep of the tide and partly to the training walls built by the Preston Corporation for the purpose of rendering the river more navigable.

Millstone Grit.

Looking eastwards from Southport there is to be seen at a distance of about ten miles a semicircular range of hills, the centre being above the village of Parbold. Above the village are extensive quarries in the grit, affording excellent exposures.

The grit is here about ninety feet thick, and consists of fine and coarse, thick bedded, white, yellow, and red sandstones, frequently current-bedded and jointed. The remains of plants are by no means infrequent, but are only found in a fragmentary state. The grit itself is underlaid by shales, flagstones, and a thin coal seam. As only the upper portion of the millstone grit is exposed the thickness of the whole is unknown.

Another interesting section can be seen at Grimshaw's Delph, about two miles from Upholland, where the grit is covered with shales and flags (Gannister beds). In the "Geology of the Country round Wigan" details are given of the Parbold quarries and also of the Grimshaw's Delph section.

Coal Measures.

Lower Coal Measures or Gannister Beds.—These beds form the lowest subdivision of the Coal Measures, and rest on the Millstone Grit, from which they are not separated by any physical break, nor is there any marked geological or mineralogical difference between them. the main distinction being that in the Coal Measures the shales are thicker, the sandstones finer, and the coal seams more numerous than in the grit.

They form a ridge which divides the Middle Coal Measures into two districts. the Skelmersdale or western and the St. Helen's and Wigan or eastern district. Numerous sections can be seen between Parbold and Appley Bridge, and along the lines of railway traversing these Lower Coal Measure rocks

Plant remains are not infrequent in the flagstones and grits and marine shells not uncommon in the shales. Many years ago these beds were carefully worked out by the late Mr. Binney, and described by him in the Proceedings of the Literary and Philosophical Society of Manchester. An excellent section can be seen at Billinge Hill, details of which are given in the "Geology of Wigan."

Middle Coal Measures.—This important subdivision can be best studied from Southport in the Skelmersdale district, distant about twelve miles from Southport, in the neighbourhood of which several collieries are worked, affording opportunities for examination of the various beds. This subdivision is of economic importance, inasmuch as it contains all the thick beds of coal. It consists of variegated coloured sandstones and shales, the latter frequently containing bands of ironstone. Sections of the coal seams in this western district are given in the "Geology of Wigan," and we cannot do better than refer the reader to this memoir.

Permian.

On referring to the map it will be seen that on it there are two small patches marked as "Permian." These lie

on the north-west slope of Parbold Hill, one at Skillaw Clough, near Bispham, about two miles from Hoscar Station on the Southport and Wigan line; the other at Bentley Brook, about one and a half miles north-east of the Bispham exposure.

Attention was first called to the Skillaw Clough exposure by Professor Hull, and a section along the Clough is given in the "Geology of Wigan." Both patches are bounded on the north-west by the boundary fault before alluded to, but on other sides are in contact with Millstone Grit. The total length of the section is about 200 feet. The rocks met with in the section, in a descending order, are—

(1). Magnesian limestone, five to six feet;
(2) Red-purple marls and shales, thirty feet;
(3) Soft red and brown sandstones, thirty-five feet;
(4) Grey and purple shales and grits (Millstone Grit).

The limestone, which is exceedingly hard, is when unweathered white in colour, but weathers to a deepish yellow. It is a true magnesian limestone, analyses showing it to contain twenty-four per cent. of $MgCO_3$. Fossils are not plentiful, but a specimen of *Schizodus schlotheimi* has been found in it. In the marls below the limestone fossils occur in at least three bands, the lowest being about ten feet below the limestone.

About five feet below the marls is a band of harder purple shales, comparatively rich in fossils (*Pleurophorus costatus*, *Gervillia antiqua*).

Immediately below the main mass of the limestone is a seam of impure limestone in which *Schizodus schlotheimi*, *S. obscurus*, and *Gervillia antiqua* have been found. No fossils have yet been found in the sandstones underlying the marls.

The junction of the Permian and Millstone Grit (here represented by grey and purple shales) can be seen in a little pool in the bed of the stream running through Skillaw Clough, four or five yards south from a point where the stream makes a sudden fall. It is difficult to determine whether the junction is an unconformable one or a fault. This section is described in a paper by Mr.

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Leese in the Second Report of the Southport Society of Natural Science, p. 48, and in two papers in the Liverpool Geological Society's Proceedings, vol. vii., p. 106 and p. 314.

Trias.

Triassic rocks occupy the entire area to the west of the boundary fault, but, as stated above, are almost everywhere hidden by superficial deposits. The following subdivisions occur in this district :—

Red Marls	Keuper.
Lower Keuper Sandstone	
Upper Mottled Sandstone	Bunter.
Pebble Beds	
Lower Mottled Sandstone	

Lower Mottled Sandstone.—This subdivision consists of soft red and yellow sandstones, made up of rounded grains, and containing very few, if any, pebbles. It is considerably developed in the neighbourhood of Liverpool, and may also be noticed in Bentley Brook, near the place where the Permian section occurs.

Pebble Beds.—The nearest point to Southport at which pebble beds occur is near Hutton, about eleven miles distant. Here the westerly extension of the Bunter is cut off by the Scarisbrick fault, which brings in the Keuper marls. The fault, however, is not visible owing to the thick covering of overlying drift. As the Ribble has excavated its valley almost entirely in the drift deposits, and as few of the stream valleys have been cut deep enough to expose the Pebble beds, opportunities for studying these in this neighbourhood are not frequent. A few years ago excellent sections in these beds were exposed in the making of the dock at Preston and the cutting of a new river channel. As a rule the rocks forming this subdivision consist of a series of deep reddish brown sandstones often much current-bedded, with, in this neighbourhood, comparatively few pebbles. They are exposed in the bed of the Ribble at Preston, near the tramroad and Penwortham bridges; near the former bridge the stone was many years ago quarried for building purposes; and the former parish church of

Preston was built from stone obtained in these quarries. The stone however was found to be lacking in durability, and the church was taken down rather more than fifty years ago.

Upper Mottled Sandstone.—This subdivision occupies a very large portion of the area under consideration, and is important in that it supplies the sand largely used for moulding. The sandstone, which is too soft for building purposes, is made up of seed-like quartz grains. The higher beds are usually bright yellow with white bands, whilst the lower are red with white streaks, and in this area rest conformably on the underlying pebble beds. The sandstones are extensively quarried in the neighbourhood of Ormskirk, and excellent sections are there to be seen. As a rule, however, the rock does not appear at the surface owing to the thick covering of drift.

Lower Keuper Sandstone.—This subdivision occurs in two separated areas, one of considerable extent lying between Halsall and Altcar, and another of more limited extent near Ormskirk. The rock, especially in the lowest beds, is coarse in character, and is usually accompanied by bands of marl. Where the junction between it and the Bunter is visible it is found to rest on the eroded surface of the latter. One of the most interesting sections in the neighbourhood occurs by the side of the St. Helens Railway, near Ormskirk. Details of this section are given in the "Geology of Wigan." The section is especially interesting on account of the evidence it affords of the unconformity of the Bunter and the Keuper series and of the upheaval and subjection of the latter to denudation before the deposition of the Keuper Sandstones.

The celebrated quarries at Storeton, from which Liverpool has drawn its chief supply of building stone, and in which footprints of the *Cheirotherium* have been found, occur in this subdivision. For further information on the footprints we refer the reader to the interesting paper by Mr. Beasley, in the Proceedings of the Liverpool Geological Society, vol. vii., p. 391.

Keuper Marls.—These consist of pale greenish grey and reddish marls and shales, with interstratified beds of

sandstone and containing pseudomorphous crystals of salt. They are the highest subdivision of the Keuper and the newest strata found in West Lancashire. With a few exceptions these beds do not appear at the surface in the Southport area. From borings made at Berry House Farm, about the centre of the site of Martin Mere, the Keuper was proved to occur thirty-eight feet below the surface, and from another boring at Mere Hall ninety-eight feet below the surface. The depth of the beds is unknown. They have been bored into at several places both north and south of the Ribble. In the "Geology of the Country round Southport" is given a section of the boring made at the Palace Hotel, Southport, which reached a depth of 558 feet without passing out of the Keuper marls. The surface of the Keuper at this place was seventy-nine and a half feet below the surface. Several sections occur in the neighbourhood of Southport, for example, beneath the boulder clay knoll at Blue Brow, near Bescar Lane Station, and to the north of this section at Brownedge, in a small ditch running to the Scarisbrick and Southport road. They are also to be found in the bed of the Douglas at Placks, near Tarleton, and form a knoll or dam in the centre of the Ribble estuary, stretching from about the fourth to the seventh mile, measuring from the Preston dock. The marl in this last-mentioned instance was exceedingly tough, and has proved a great obstacle in dredging operations. The marls are usually associated with gypsum, and frequently pieces of gypsum are found in the boulder clay which have evidently come from the marl or lying on the shore washed out of it.

Glacial Clay.

In few parts of England can that combination of clay, sand, and gravel, known as the "Glacial Drift," be better examined than in South Lancashire, overlying as it does the greater portion of the Pre-Glacial rocks, except at comparatively few places, and underlying the large peat mosses and areas of blown sand. It has been estimated to cover in the Ribble Valley alone nearly 400 square miles.

The drift is frequently of very great thickness, being upwards of two hundred feet thick at Preston, while the whole lower valley of the Ribble is excavated out of it. In that district it consists of an upper clay separated from a lower by a bed of sand and gravel: these strata are very well seen on the banks of the Ribble, especially at Red Scar, about three miles above Preston. In the Southport district, however, marine erosion and denudation below the twenty-five feet contour, and subaerial denudation above that level have so altered the surface of the glacial drifts that it is extremely difficult, if not impossible, to differentiate between the Upper and Lower Glacial clays. These clays are, in this district, a dull brick-red colour, and contain embedded in them a large number of boulders about fifty per cent. of which are ice-scratched, the striations when observable generally pointing between 20° and 30° west of north. In some cases the boulders have apparently been water-worn before being scratched. Among the boulders recorded as occurring in this district are Silurian Grit and Slates, Carboniferous Grits and Limestones, Eskdale and Buttermere Granite, and also many local granites from the South-west of Scotland. No Ailsa Craig or Shap Granite has been recorded, although the latter occurs plentifully in the Upper Lune Valley and to the east of the Pennine chain.

The largest boulder that has been discovered was one found in a clay pit at Great Crosby, between Liverpool and Southport, at a depth of twenty feet below the surface and about three feet below the level of an ordinary spring tide. This boulder weighs about eighteen tons, and is composed of gypseous alabaster. It is unfortunately impossible to determine its place of origin, as gypseous alabaster occurs in the Keuper marls of Derbyshire, Staffordshire, and Cumberland, but has not been found to occur in any large quantities in the Keuper marls of this district. Mr. Edward Peters, the owner of the quarry, offered the boulder to the District Council of Great Crosby, which, acting in a commendable public spirit, erected it in the centre of the village and enclosed

it with railings. Chiefly owing to the care and forethought of Mr. T. Mellard Reade. F.G.S., of Blundellsands, the boulder has been placed in the exact position in which it occurred in the boulder clay as regards orientation and dip; owing however to the high angle at which the bed of the boulder stood it has been placed at 9° less inclination transversely to the axial line than when found, lest it should slip off its bed.



H. Brodrick. CROSBY BOULDER, FROM S.W. *Photo.*

In Crossens village there are three boulders which deserve passing mention. Two of these, found in the village some seventeen feet below the surface, are in the churchyard—one is of Carboniferous Limestone and the other of Eskdale Granite. Each of these measures about three feet by two feet, and both are considerably ice-scratched. The third, about five feet long and eighteen inches in diameter, is in a cottage garden on the opposite side of the main road to the church, and is

Silurian Grit. It is impossible to say at what level this was found as it is stated to have been in its present position for eighty years.

The boulder clay also contains a considerable number of shells of an arctic type, but mostly in a very fragmentary condition. Among others that have been identified are *Turritella terebra*, *Purpura lapillus*, and *Cyprina islandica*.

The Foraminifera of these clays have not been very extensively investigated; Mr. Joseph Wright, of Belfast, has examined four samples of about two pounds each from the Crosby clay pit, and found a curious preponderance of *Nonionona depressula*, more than 2,000 of this species being found in a total of 2,500 specimens.

The following is a list of the Foraminifera found by Mr. Wright, with his notes upon them, taken from the seventh and eighth reports of the Liverpool Geological Society :—

Miliolina tenuis (Czjzek.) Common.
M. *subrotunda* (Montg.) Very rare.
Textularia globulosa (Ehr.) Very rare.
Bulimina pupoides (d'Orb.) Rare.
B. *marginata* (d'Orb.) Very rare.
B. *fusiformis* (Will.) Very rare. Frequent.
B. *elegantissima* (d'Orb.) One specimen.
Virgulina Schreibersiana (Czjzek.) Very rare.
Bolivina punctata (d'Orb.) Rare.
B. *plicata* (d'Orb.) Very common.
B. *dilatata* (Rss.) Common.
B. *obsoleta* (Eley.) One specimen.
Cassidulina crassa (d'Orb.) Frequent.
C. *lævigata* (d'Orb.) Very rare.
Lagena globosa (Mont.) Very rare.
L. *lineata* (Will.) Very rare.
L. *sulcata* (W. and J.) Very rare.
L. *hexagona* (Will.) Very rare.
L. *lævigata* (Rss.) Very rare.
L. *lævis* (Mont.) Very rare.
L. *costata* (Will.) Very rare.
L. *Williamsoni* (Alcock.) Frequent.

Lagena lucida (Will.) Rare.
L. *squamosa* (Mont.) Very rare.
L. *orbignyana* (Seg.) Very rare.
L. *fimbriata* (var. *Danica*, Madsen). Rare
First record in England.
L. *striata* (d'Orb.) Very rare.
L. *marginata* (W. and B.) Very rare.
L. *hexagona* (Will.) Rare.
Polymorphina angusta (Egger.) Very rare.
P. *myristiformis* (Will.) Very rare.
Nodosaria pyrula (d'Orb.) One segment.
Uvigerina angulosa (Will.) Frequent.
U. *canariensis* (d'Orb.) Very rare.
Orbulina universa (d'Orb.) Very rare.
Globigerina bulloides (d'Orb.) Frequent specimens, small.
Discorbina rosacea (d'Orb.) Very rare. Specimens small.
D. *globularis* (d'Orb.) Very rare. Specimens small.
D. *Bertheloti* (d'Orb.) Very rare. Specimens small.
Truncatulina lobatula (W. and J.) Rare. Specimens small.
Planorbulina mediterranensis (d'Orb.). Very rare.
Pullenia sphæroides (d'Orb.) One specimen.
Patellina corrugata (Will.) Very rare.
Pulvinulina Karsteni (Rss.) Very rare.
P. sp. near *auricula* (F. and M.) Very rare.
Rotalia Biccarii (Linn.) Very rare. Specimens small.
R. *Biccarii* (var. *lucida*, Madsen?) Very rare.
Nonionina depressula (W. and J.) Most abundant.
Polystomella striatopunctata (F. and M.) Frequent.
Ostracoda are of very rare occurrence.

Glacial Sands and Gravels.

Several deposits of these sands and gravels occur in the district, one of the most important being that at

Leyland, which is described by R. D. Darbishire, B.A., F.G.S. (Vol. XXX. Quarterly Journal of the Geological Society). The gravel obtained here is much used in the district for road making. The deposit, the lower layer of which is about 250 feet above sea level, is about forty feet thick, and is composed of marine gravel (shingle), very rarely showing any clayey admixture, with occasional small and thin layers of fine sea sand. The characteristic fossil of this bed is coral from the mountain limestone; several species occur in masses with the matrix dissolved away, exhibiting the polypidom singularly clean and perfect. Small fragments of marine shells occur sparsely throughout the whole bed, but more frequently immediately above the mass of fine sand upon which the main bed of the gravel rests. Some of the larger stones exhibit glacial striation, and occasional small much-worn flints occur; limestone pebbles burrowed by *Saxicava rugosa* occur comparatively frequently. The late Miss M. H. ffarington, of Worden Hall, carefully collected shells and fragments as they occur in these gravel pits; a full list, 46 in number, is given by Mr. Darbishire in his paper.

The list contains the names of a few mollusca of northern character (*Astarte* and *Fusus*) and also several shells of markedly southern origin. Only one shell *Trophon craticulatus*, Fabr. a species now living in Greenland is peculiarly arctic in character; with this exception the whole series may be said to be very similar to that of the fauna of the present seas along the western shores of Britain.

Shirdley Hill or Washed Drift Sand.

Resting on the boulder clay over a considerable area occur those deposits of sand called by C. E. De Rance, in the Geological survey of this portion of Lancashire, the "Shirdley Hill Sand," and by T. Mellard Reade the "Washed Drift Sand." These sands have probably been sorted out of the boulder clay by marine erosion following on the glacial period; on a subsequent elevation of the coast (possibly slight) a line of ancient

sand dunes was formed in a similar manner to those at present fringing the coast; then by the action of the wind this sand was blown far and wide over the surrounding country. This sand is composed of grains all rounded in a similar way to those of the present dunes as if by the action of the wind; the latter sand however is easily distinguished by its smaller grains and an admixture of black specks which are absent in the former.

This drift sand shades in clearly marked bands from dark brown to red, orange, and white, the last more frequently when in contact with the peat, which seems to have a bleaching action on the sand. These colours are probably caused by infiltration, and do not imply that there have been successive depositions by water agency of different coloured sands. Minute fragments of marine shells occur in these deposits, and in the upland plain a very perfect fresh-water *Limnaea* has been found. The thickness of this sand is a very variable, often ranging from twenty feet to nothing in a short distance. As might be expected from such a deposit the sand occurs at times on high ground and not on low, and vice versa. In some localities it is difficult to distinguish it from the true sands of the glacial drift in the interior; in fact in certain places near Upholland the matter is still open to argument. It sometimes rests on a thin growth of peat, as do the present sand dunes. A very good section of this drift, nine feet deep, is to be seen in a sand pit near Holmes Wood Hall.

Grey Clays.

Underlying the main peat bed and extending under the sea is a bluish-grey silt containing marine shells. Foraminifera, and marine Diatomaceæ and also fresh-water shells and rushes. A considerable controversy has raged as to whether this clay is of marine or fresh-water origin, the probability being that it is partly one and partly the other, having been formed in marshy ground at the edge of the sea subject at times to marine incursions. This grey silt or clay, of which the greatest thickness is about twenty feet, does not appear at the

surface and gradually thins out under the peat to a line stretching from the mouth of the Alt to the mouth of the Douglas, about three miles inland of the present coast. To the east of this the peat usually rests upon a thin bed of sand similar to if not identical with the Shirdley Hill sand. In this silt have been found the bones of horses and antlers of the red deer and of *Bos taurus* and *Bos longifrons*, and also a human skeleton. An attempt at brick making has been tried with this clay, but with only slight success.

Peat.

One of the features of the district is the great area covered by peat mosses which reach, in an unbroken line at least two miles broad, for a distance of over twelve miles from the mouth of the Douglas to the mouth of the Alt, while a branch of the same moss extends along the western side of the former river, separated from it by a bank of boulder clay, for some eight miles. Isolated mosses also occur in several other parts of the district. The base of these mosses is almost invariably composed of a submerged forest which has been destroyed by the growth of the aquatic plants which form the peat. The trees of this forest are chiefly oaks and Scotch firs, mostly of gigantic size; yew trees and pollard ashes also occur. They are at times dug out of the moss lands when they occur near the surface and interfere with ploughing, and may be seen lying at the sides of the fields. When the trees are exposed in the mosses it is usually found that they are laid with their heads pointing in a north-easterly direction, as if they had been blown down by a south-west wind, the strongest in this district. It has been stated that in certain cases these trees seem to have been cut down. This forest extended under the present sea and may be seen at Leasowe in Cheshire and to the north of the mouth of the Alt, where the erosion by the sea has exposed the stumps of the trees, the roots usually descending into the sand or clay underlying the peat beds. Probably owing to a subsidence of the coast the drainage of the district seems to have become obstructed, for an old river bed filled with silt was exposed some

years ago near Crossens during the cutting of one of the sluices. The bottom of this river was then proved to have been lower than that of the Alt or Douglas at the same relative points, and so, on a subsidence of the land, it would be more likely to become obstructed, especially as it drained a less area. Owing to this obstructed drainage, water lodged on the low lying plains and produced conditions favourable to the formation of peat and fatal to the existence of trees. The thickness of these peat beds is very great, reaching nearly twenty feet in places, as at Wyke Farm and Mere Farm, inland of Southport. These beds with forest trees have been proved to be continuous with the submarine forest at the mouth of the Alt, and probably extended to a considerable distance westwards of the present coast line, as peat is occasionally dredged from the Bog Hole—the deep channel off the pier head. Quantities of hard shaley-peat are frequently washed ashore between Birkdale and Formby, mixed with a considerable number of stems and leaves of freshwater plants, as well as leaves and branches of various forest trees more or less coated with *Eschara* and other Polyzoa, and many of the branches have been bored by *Pholades*, proving them to have been fixed between tides for a considerable period. On the surface of these peat beds lakes formed, the chief of which—Martin Mere—will be mentioned in a later portion of the handbook.

Alluvium.

The valleys of the Alt and Douglas are considerably silted up with alluvium which seems to be chiefly of marine origin, and is probably similar to the salt marsh clays which are now being formed by the united action of the tides and the Ribble in the upper part of its estuary. The deposit of alluvium which has closed the old river bed at Crossens and covered the surrounding area is also of the same nature. Exposed at low water at several points between Southport and Freshfield is a bed of laminated stratified clayey sand, very dark grey when wet and light grey when dry; it is probably also an

estuarine deposit. The following mollusca have been found in it :—

Turritella communis.
Fusus contrarius.
Tellina balthica.
Mactra solida.
Psammobia ferroensis.
Donax vittatus.

The small area of alluvium occurring to the west of Rufford consists of ordinary sandy loam, and is derived from Martin Mere.

Blown Sand.

The most noticeable feature of the district is the great area covered by sand dunes, or sand hills as they are generally called. The coast is fringed with a belt of these dunes for a distance of about sixteen miles, from North Meols or Churchtown in the north to Bootle in the south, this belt being from two to three miles in width. The sand dunes rest upon the upper peat moss and rise in places to a height of nearly eighty feet above ordnance datum. The base of the older or more easterly sand dunes is a stratified deposit, having evidently been blown on to the marshy ground. It contains large numbers of *Bithynia tentaculata* and other freshwater shells in a good state of preservation. From the occurrence of these shells Mr. C. E. De Rance gives this lower stratum the name of Bithynia sand. It also contains a comparatively small number of marine shells, mostly worn and broken, which have been blown inland with the sand. This underlying marsh is permeated by what is locally known as the "Ream," which is the surface water of the moss upon which the sand dunes rest. This water is very close to the surface in places, in some of the low lying parts of Birkdale and Southport being only two feet down. It is owing to the presence of this ream water that so many of the houses are built on raised ground in order to make provision for cellars.

These dunes are of comparatively recent origin, and it is probable that none of them have been in existence for

a much longer period than four hundred years. At Formby Point, where there is now a tract of sandhills nearly four miles in width, no dunes are said to have existed in 1690. The sand is stated to have commenced blowing from a sand bank that had closed the mouth of the Alt, which before then flowed out to the north of its present mouth and formed a comparatively important harbour. The blowing sand at this point covered the old church yard, with the result that the church was pulled down and rebuilt further inland about 1750. A large tract of cultivated land was at the same time entirely covered and rendered useless. and is at times exposed in the digging of wells and other excavations. These sand dunes are now kept under much better control than formerly owing to the systematic planting of starr grass, or marram (*Psamma arenaria*), the long and matted roots of which help to keep the sand from blowing. The experiment of planting pines in the hills has met with some success near Ainsdale. When levelled this sand lends itself exceedingly well to the cultivation of asparagus, "Formby asparagus" being particularly noted. Potatoes also flourish in the sand, and there is a tradition that the first potatoes grown in England were grown at the same place, a ship bearing them having been wrecked on the coast. Southport and Birkdale are entirely built on this sand dune belt, the ground being simply levelled for the buildings. Slight foundations only are necessary in most cases.

Rain water charged with carbonic acid gas has the power of dissolving the numerous shells in the blown sand, forming bi-carbonate of lime. From the solution the lime is redeposited, forming a crust sufficiently solid to hold water in the low hollows between the sand dunes. After heavy rain a series of shallow pools is produced in this way in the depressions locally called "slacks" between the sandhills. These slacks were until recently of considerable extent and were noted for rare plants, many of which are usually only found in chalk districts. The greater number of these slacks have, however, been drained and converted into golf links.

The dunes are now rapidly increasing on the western or sea side, a belt nearly 150 yards wide, and in places over twenty feet high, having formed outside the Birkdale esplanade since it was constructed in 1884. The increase is greater at this place than further south, owing to the set of the tides and the prevailing winds. Another cause is that of late years the surface water or ream, which formerly was allowed to flow on to the shore, has been diverted by drains, with the result that the shore is not kept so wet as formerly, and is more rapidly dried by the sun and wind and so blown into dunes.

THE RIBBLE ESTUARY.

By Edmund Dickson, F.G.S.

About the year 1883 the Preston Corporation obtained powers enabling them to take over an existing company concerned in the navigation of the Ribble, and to expend further sums of money on the improvement of the Ribble for navigation purposes. The operations included the making of a new dock of forty acres at Preston, diverting the river channel, and dredging and embanking channels in the estuary. During the course of the excavations a large number of remains were found, a list of which is given in the Proceedings of the Liverpool Geological Society, vol. 7, page 135. The greatest interest possibly attaches to the discovery of the astonishing number of heads of the Urus which were found of all sizes and of all ages. In addition to the skulls of the Urus, there were found antlers of red deer, remains of whales, twenty-one human skulls, a bronze leaf-shaped spear head, an iron axe, and two boats. The best preserved of the Urus skulls, some of the human skulls, the spear head, axe, and boats can be seen in the museum at Preston.

The upland water discharged by the Ribble is very variable, and in time of flood an enormous amount of detritus is brought down as waste from the drift. The

result of this has been that the channels are exceedingly unstable, and old courses appear over the whole river valley. Before 1806 the whole space between Preston and the sea might be considered as an estuary, but since that year works have been carried out at different times by the riparian owners, having for their object the reclamation of the riparian marsh land. Moreover, with a view of improving the navigation of the river, training walls have been built in different parts of the estuary, the intention being that the tidal water, instead of being allowed to wander over the estuary, should be directed into one channel. The effect of the reclamation has been to reduce the tidal volume, as each yard reclaimed means so much less tidal water, and consequently so much less scour; the effect of the training walls has been that, while increasing the flood in the trade channel, the stagnation in the rest of the estuary has been increased, inducing much alluvial deposit. Thus during the last sixty years a very large area of what was formerly estuary has been converted into fields and productive marshes.

The bed of the estuary covers an area of about fifty-seven square miles, and is composed of fine sand overlying gravel, resting on boulder clay. The charts show that before the estuary was in any way interfered with there were always two channels navigable for vessels of small tonnage, and that whilst the northern channel has always been liable to changes of position, the southern channel, from the sea to Southport, has been more constant.

In the Third Report of the Southport Society of Natural Science illustrations are given of the various charts of the Ribble, commencing with one of 1689, and each of the charts is briefly described. An examination of these charts shows how unstable these channels have been, and also how frequently it has happened that, within the space of a few years, they have often completely altered their relative positions and character. The following is a list of several of the principal charts with the date of each :

(1) The earliest chart of the Ribble is one of 1689, on which two channels are shown open to the north, divided only by a slight belt of sand and a short south channel open from Lytham to Southport.

(2) A chart of 1736 by Fearon and Eyes shows that instead of two channels to the north there was one narrow channel up what is now called the North Hollow, and that the main channel was at that date in the middle of the estuary. There is also shown a south channel from Formby point past what is now Southport, and a communication between Crossens Pool, and the main channel.

(3) A chart of 1761 by Mackenzie also shows three channels in the estuary, but their directions and their position in the estuary have altered since 1736.

(4) There is also another chart by Mackenzie in 1775.

(5) A map of 1786 by Billing shows the river above Lytham opposite the Guide's House fordable at low water, and a good south channel running past Southport.

(6) A chart of 1796 shows the north channel and the south channel, but only a very short central channel.

(7) Another chart, dated 1809, shows a main channel in the estuary passing along the Lytham shore, and a buoyed channel down the centre. The north channel appears blocked up at the south-east end. The south channel is buoyed and appears blocked at what is now Crossens. The position of the banks is very different from that shown on the earlier charts.

(8) Brazier's chart of 1820 shows a main channel through what is now Pinfold or Gut channel, but not a trace of the north channel. The south channel which, in the chart of 1809 is shown as blocked up at Crossens, in this one appears to run through to the main channel, and there is a communication between the Crossens Pool and the south channel. Opposite Southport at this date a depth is shown of twenty-four feet at low water. A comparison of this chart with that of 1809 abundantly proves how

extensive have been the changes in the position of the banks in so comparatively short a period as eleven years.

(9) A chart by Belcher, of 1837, which gives a fairly good channel to the south, and one to the north, the south channel running up in a north-easterly direction nearly opposite to Lytham.

(10) A chart by Stevenson, of 1852, gives a broad south channel connected with Crossens Pool, but totally unconnected with the main channel, the intervening space being occupied by sandbanks. There is, however, shown a good north channel, and a central channel which is called the New Gut. For navigable purposes, the river in 1852 seems to have been better than in earlier, or indeed in later, times.

(11). A chart by Calver of 1860, which shows two channels, the north channel and the central channel. The channel running out of Crossens Pool ran (in 1860) into what is now the Bog Hole, opposite Southport, which then had a depth of about thirty feet at low water. There is a narrow communication between the Pinfold and south channel, but none between the south channel and the central channel.

In the case of an estuary like that of the Ribble, it would seem that it is the scour of the tidal water, and not the upland waters brought down by the river, that keeps the main channel open. As the duration of the flood tide in the estuary during spring tides is four hours and that of the ebb tide eight hours, it follows that the flood tide must run at a greater speed than the ebb, since the time is less, the difference in the velocity being from half to three-quarters of a mile per hour. The greatest velocity of the flood was estimated by Mr. G. N. Abernethy at three and three-quarter miles per hour, and that of the ebb at three and a quarter.

The flood comes in with a bore, passing rapidly over the sands and carrying with it detritus which the ebb by reason of its lower velocity has not the power to remove. In addition to the sand and sediment brought up by the flood, an immense quantity of sand is also washed into

the channels by the water flowing from the surrounding banks. As a result of this a vast accumulation of sand takes place which the ebb tide cannot remove. Therefore the banks and channels in the estuary alter in form and position more or less at every tide, and it is no uncommon occurrence after a storm for a channel to be entirely obliterated.

It has always been a matter of surprise, since the banks are so prone to alter their position, that the remarkable depression opposite the end of the pier at Southport, and known as the Bog Hole, in consequence of peat occurring below the sand, has for so long maintained its present position and depth. On comparing the various charts it would seem that the depth of the Bog Hole is greater now it is a "blind" channel than when it was connected with the main channel flowing past Lytham. It has been suggested as a reason for this increased and continued depth that the eddying motion set up by the flood tide has an excavating action, an action which would not occur if the southern channel were again connected with the northern, a frequent occurrence during the last hundred years. Probably if the north and south channels were again connected, or even if Crossens channel and the south channel were united, the result would be that this deep depression opposite Southport would be shallowed or possibly silted up altogether.

There has been undoubtedly of recent years a great accumulation of sand opposite Southport. It is comparatively few years since the tide reached the wall of the old promenade in front of the Victoria Hotel and the walls and fences below the gardens belonging to the houses facing Westcliffe-road. It appears to be the case that whenever any obstruction, whether great or small, is placed upon the shore, the sand is driven by the prevailing westerly winds and accumulates in front of the obstruction. *It would have been the best treatment of the Southport shore to have left it severely alone*, as when sand accumulation once commences the process is one which it is exceedingly difficult to stop.

BOTANY.

By W. H. Stansfield, F.R.H.S., and Henry Ball, M.P.S.

IT is a well-known fact that the geology of a country or of a district plays an important part in the nature of the Flora and its distribution over that particular area.

One of the salient features of the geology of this part of Lancashire is the enormous accumulation of blown sand, extending from Churchtown to Waterloo, a distance of twelve miles, and varying in width from one to four miles.

This area, so barren to the superficial observer, is of great interest to the botanist, more especially to one not previously acquainted with our littoral Flora.

The advent of the speculative builder, and the various "improvements" which follow the march of civilisation, have already told adversely upon our local Flora. By the construction of the Marine Park we lost two of our local plants, *Polygonum roberti* and *Polygonum aviculare*, var. *littoralis*, and in the construction of the Birkdale Recreation Ground a well-known habitat of the rare moss *Pottia heimii* was entirely destroyed. The botanist will, however, find even yet on our sandhills many rare and interesting plants, in such abundance too, as cannot be equalled in any other part of Great Britain.

One of the chief of these is *Pyrola rotundifolia* var. *maritima*, growing in such lavish profusion as to almost carpet the ground in some places to the extent of several acres. There is no doubt whatever that at one time this plant grew in the same luxuriant way upon the land on which Southport is now built, for it may still be found sparingly among the sandhills immediately behind Park-crescent, where, however, it is rapidly becoming extinct.

There is still another very interesting group of plants to which we should like to direct special attention, the genus *Erythræa*, for it is probable that nowhere else in Britain are these plants found in such abundance as amongst the sandhills between Southport and Waterloo. The most common is *Erythræa littoralis*, Fr., a comparatively rare British plant, with its two forms which have been described as *E. gothlandica* and *E. minor*. Another frequent plant is *Erythræa pulchella*, appearing in one or two well-defined forms. This plant is much more common on the north side of Southport. A third and somewhat widely distributed species is *Erythræa centaurium*, Pers., of which a well-defined variety known as *E. centaurium* var. *capitata*, Koch. The last and most interesting is *Erythræa latifolia*, Sm., interesting from the fact that the sandhills between Southport and Seaforth are the only known habitat of this rare plant. It has never been found anywhere else in Britain. As it is now more than thirty years since the plant was recorded, there is some fear that it is now lost to the British Flora. All the specimens in the Natural History Museum, South Kensington, are from the neighbourhood of Formby.

The inland Flora is characterised by the great abundance of water plants that are to be found in the numerous ditches cut in the peat, running in all directions and intersecting the moss land, which covers such a large proportion of our area. In some of these ditches the surface of the water is covered with *Hottonia palustris*, *Hydrocharis*, *Morsus Ranæ* (*Batrachian palustre*), *Œnanthe phellandrium*, *Stratiotes Aloides*, and along the railway between Burscough and Preston Junction the ditches are entirely filled with *Typha latifolia* and *T. Angustifolia*, *Sparganium ramosum* and *S. Simplex*, with an occasional specimen of the beautiful *Butomus umbellatus*.

The most interesting of the inland plants is the rare *Gentiana pneumonanthe*, found growing in great abundance about one mile inland from Woodvale railway station. This is a most variable species growing from three to fifteen inches in height.

On the whole our local Flora is fairly rich, both in genera and species. It contains over 830 specimens of plants, of which about 800 are flowering plants, the rest being Cryptogams, numbering 31 species.

The nomenclature adopted is, in the main, that of the Ninth Edition of the London Catalogue of Plants.

Ranunculaceæ.

Thalictrum flavum *L.*—Lydiate.
Anemone nemorosa *L.*—Woods, Rufford.
Adonis autumnalis *L.*—An alien. Occasional in cornfields.
Ranunculus circinatus *Sibth.*—Ponds.
R. **Drouetii** *Godr.*—Great Crosby.
R. **Heterophyllus** *Web.*—Ponds, Ditches.
R. **Tricophyllus** *Haix.*—Lydiate.
R. **peltatus** *Schr.*—Ditches.
R. **Baudotii** *Godr.*—Formby.
R. **Lenormandi** *F. Schultz.*—Aintree.
R. **hederaceus** *L.*—Common.
R. **sceleratus** *L.*—Common.
R. **Flammula** *L.*—Ditches, Upholland.
R. **Lingua** *L.*—Ditches.
R. **auricomus** *L.*—Croxteth, West Derby.
R. **acris** *L.*—Common.
R. **repens** *L.*—Common.
R. **bulbosus** *L.*—Sandhills, common.
R. **sardous** *Crantz.*
R. **parviflorus** *L.*—Crosby, rare.
R. **Ficaria** *L.*—Common.
Caltha palustris *L.*—Marshy places.
Delphinium Ajacis *Reichb.*—Birkdale sandhills. An alien.

Berberideæ.

Berberis vulgaris *L.*—Knowsley Woods, Crosby, Simmonswood.

Nymphæaceæ.

Nymphæa lutea *L.*—Sandhills, Formby. R. Alt.
Castalia speciosa *Salisb.*—West Derby.

Papaveraceæ.

Papaver somniferum *L.*—Occasionally.
P. Rhœas *L.*—Frequent.
P. dubium *L.*
P. ,, *Lamottei Bor.*—Common.
P. ,, *Lecoqii Lamotte.*
P. Argemone *L.*—Common.
Glaucium flavum *Crantz.*—Rare—Occasional.
Chelidonium majus *L.*—Southport.

Fumariaceæ.

Neckeria claviculata *N.E.Br.*—Common.
Fumaria pallidiflora *Jord.*—Rare.
F. confusa *Jord.*—Common.
F. officinalis *L.*—Common.

Cruciferæ.

Nasturtium officinale *R. Br.*—Common.
N. palustre *D.C.*—Aintree.
N. amphibium *R. Br.*—Southport.
Barbarea vulgaris *R. Br.*—Frequent.
B. intermedia *Bor.*—Rare.
B. præcox *R. Br.*—Occasionally.
Arabis Hirsuta *Syme.*
A. sagittata *D.C.*—Formby.
Cardamine amara *L.*—Upholland.
C. pratensis *L.*—Common.
C. hirsuta *Scop.*—Common.
Alyssum maritimum *L.*—Sandy ground.
Erophila vulgaris *D.C.*
E. verna *L.*—Common.
Cochlearia Armoracia *L.*—Alien.
C. anglica *L.*—Sea coast.
C. danica *L.*—Rare.
Hesperis matronalis *L.*—Aintree, rare.
Sisymbrium Thalianum *J. Gay.*—Common.
S. officinale *Scop.*—Common.
S. Sophia *L.*—Frequent.
S. Alliaria *Scop.*—Dry banks, common.

S. pannonicum *Jacques.*—Crosby.
Erysimum orientale *R. Br.*—Occasional.
E. cheiranthoides *L.*—Barton.
Brassica Napus *L.*—Occasional.
B. Rapa *L.*—Occasional.
B. Sinapistrum *Boiss.*—Common.
B. alba *Boiss.*—On rubbish heaps, occasional.
Diplotaxis muralis *D.C.*—Freshfield, Scarisbrick.
Bursa Bursa-pastoris *Weber.*
Lepidium ruderale *L.*—Formby, Aintree.
L. sativum *L.*—Aintree, outcasts from gardens.
L. campestre *R. Br.*—Frequent.
L. Hirtum *Smith.*—Childwall Church.
L. Draba *L.*—Canal bank, Aintree. Rare.
L. perfoliatum *Reich.*—Casual, Formby.
Thlaspi arvense *L.*—Kirkby, Woolton, Formby.
Teesdalia nudicaulis *R. Br.*—Cricket field, Roe-lane, Formby, Crosby, Haskayne.
Cakile Maritima *Scop.*—Sea shore.
Raphanus raphanistrum *L.*—Cultivated ground, occasional.

Resedaceæ.

Reseda alba *L.*—Southport, occasional.
R. luteola *L.*—Occasional.
R. Lutea *L.*—Railway embankment, Aintree.

Violarieæ.

Viola palustris *L.*—Knowsley Wood, River Alt, Lydiate.
V. odorata *L.*—Croxteth Woods.
V. sylvestris *Fries.*—Woods and hedge banks.
V. canina *L.*—Sandhills.
V. ,, *flavicornis Sm.*—Sandhills.
V. tricolor *L.*—Simmonswood. The Moss Land.
Tricolor var.
V. Carpatica *Borbas.*—Simmonswood moss.
V. arvensis *Murr.* - Common.
V. Curtisii *Forster.*—Formby, Waterloo.

Polygaleæ.

Polygala vulgaris *L.*—Occasional.
P. oxyptera *Reichb.*—Formby, Crosby.

Caryophylleæ.

Saponaria Vaccaria *L.*—Casual, cornfields.
S. officinalis *L.*—Southport.
Silene maritima *With.*—Southport.
S. anglica *L.*—Ainsdale, Crosby sandhills.
S. noctiflora *L.*—Crosby, Freshfield.
Lychnis Alba *Mill.*—Common.
L. doica, *L.*—Common.
L. Flos-cuculi *L.*—Damp meadows.
L. Githago *Scop.*—Occasional, cornfields.
Cerastium quaternellum *Fenzl.*—Near Hightown Station.
C. tetrandrum *Curtis.*—Southport.
C. semidecandrum *L.*—Sandhills.
C. glomeratum *Thuill.*—Common.
C. triviale *Link.*—Common.
C. arvense *L.*—Southport.
Stellaria aquatica *Scop.*—Scarisbrick.
S. media *Cyr.*—Common.
S. Holostea *L.*—Common.
S. palustris *Retz.*—Martin Mere, rare,
S. graminea *L.*—Common.
S. uliginosa *Murr.*—Common.
Arenaria trinervia *L.*—Common.
A. serpyllifolia *L.*—Common.
A. peploides *L.*—Sea shores, common.
Sagina maritima *Don.*—Occasional.
S. apetala *L.*—Dry walls, frequent.
S. ciliata *Fr.*—Sandhills, Freshfield.
S. procumbens *L.*—Dry walls.
S. nodosa *Fenzl.*—Sandhills near the sea.
Spergula arvensis *L.*—Cornfields, common.
Buda Rubra *Dum.*—Barton, Haskayne.

Portulaceæ.

Claytonia perfoliata *Dom.*—Birkdale, Southport.
Montia fontana *L.*—Common.

Elatineæ.

Elatine hexandra *D.C.*—Lake, Knowsley Park.

Hypericineæ.

Hypericum hircinum *L.*—Ince Blundell. rare.
H. perforatum *L.*—Hedge banks, frequent.
H. dubium *Leers.*—Common on the moss.
H. humifusum *L.*—Frequent on the moss.
H. pulchrum *L.*—Dry banks, frequent.

Malvaceæ.

Malva sylvestris *L.*—Road sides, waste places. frequent.
M. rotundifolia *L.*—Waste places. occasional.

Lineæ.

Radiola linoides *Roth.*—Seaforth, Simmonswood moss.
Linum cartharticum *L.*—Frequent.
L. angustifolium *Huds.*—Occasional.
L. usitatissimum *L.*—Occasional.

Geraniaceæ.

Geranium molle *L.*—Common.
G. Pusillum *L.*—Hightown, rare.
G. dissectum *L.*—Cultivated fields, occasional.
G. columbinum *L.*—Simmonswood moss.
G. Robertianum *L.*—Common.
Erodium cicutarium *L'Herit.*—Sandy ground, sea side.
E. moschatum *L'Herit.*—Aughton, Ormskirk, Lathom.
Oxalis Acetosella *L.*—Shady woods and hedge banks.
O. corniculata *L.*—As a casual in gardens.

ILICINEÆ.

Ilex Aquifolium *L.*—Woods and hedges.

RHAMNEÆ.

Rhamnus Frangula *L.*—Simmonswood moss, Bath wood, Ormskirk.

SAPINDACEÆ.

Acer Pseudo-platanus *L.*—Denizen.
A. Campestre *L.*—Occasional, planted.
Æsculus hippocastanum *L.*—Alien.

LEGUMINOSÆ.

Ulex europæus *L.*—Hedge banks, common.
Cytisus scoparius *L.*—Occasional, railway embankments.
Ononis repens *L.*—Common near the sea.
O. spinosa *L.*—Frequent, Marshside.
Medicago sativa *L.*—Formby sandhills, alien, frequent.
M. falcata *L.*—Aintree, occasional.
M. lupulina *L.*—Common in clover fields, sown.
M. denticulata, *Willd.*—Kirkby, banks of canal, Aintree.
M. arabica *Huds.*—Aintree.
M. minima *Desr.*—Casual.
Melilotus altissima *Thuill.*—Frequent.
M. officinalis *Lam.*—Occasional.
M. alba *Desr.*—Formby.
M. arvensis, *Wallr.*—Formby.
M. parviflora, *Desf.*—Occasional.
Trifolium pratense *L.*—Common.
T. medium *L.*—Occasional, cornfields.
T. ochroleucon *Huds.* Railway banks, Fazackerly.
T. incarnatum *L.*—Sandhills, occasional.
T. arvense *L.*—Frequent.
T. striatum *L.*—Hightown and Formby.
T. hybridum *L.*—Cornfields, alien.

T. repens *L.*—Common.
T. fragiferum *L.*—Occasional, Hall Road.
T. procumbens *L.*—Common.
T. dubium *Sibth.*—Common.
T. filiforme *L.*—Occasional.
Anthyllis Vulneraria *L.*—Sandhills, common.
Lotus corniculatus *L.*—Waysides, common.
L. uliginosus *Sch.*—Common.
Ornithopus perpusillus *L.*—Southport, frequent.
Vicia tetrasperma *Moench.*—Rare.
V. Cracca *L.*—Common.
V. sepium *L.*—Frequent.
V. sativa *L.*—Alien, frequent.
V. angustifolia *L.*—Common.
,, **Bobartii** *Koch.*—Hesketh Park.
V. lathyroides, *L.*—Frequent.
Lathyrus Aphaca *L.*—Crosby, Aintree, rare.
L. pratensis *L.*—Common.
L. tuberosus *L.*—The moss, frequent.

Rosaceæ.

Prunus spinosa *L.*—Common, Hesketh Bank.
P. domestica *L.*—Denizen, Childwall.
P. Padus *L.*—Denizen, Childwall.
Spiræa Ulmaria *L.*—Common.
Rubus idæus *L.*—Common.
R. fruticosus.—Common.
,, **corylifolius** *Sm.*
,, **carpinifolius** *W. and N.*
,, **glandulosa** *Bell.*
,, **sub-erectus** *Anderson.*
R. cæsius *L.*—Common.
Geum urbanum *L.*—Hedge banks, Scarisbrick.
G. rivale *L.*—Bath wood, Scarisbrick.
Fragaria vesca *L.*—Common.
Potentilla fragariastrum. *Ehrh.*—Common.
P. procumbens *Sibth.*—Common.
P. reptans *L.*—Common.
P. Anserina *L.*—Common.
P. palustris *Scop.*—Common.

Alchemilla arvensis *Scop.*—Common.
A. vulgaris *L.*—Common.
Agrimonia Eupatoria. *L.*—Sandhills.
Poterium Sanguisorba *L.*—Halsall, rare.
P. officinale, *Hook.*—Rufford.
Rosa spinosissima *L.*—Crosby, Waterloo.
R. mollis *Sm.*—Cath's wood, Ormskirk.
R. tomentosa *Sm.*—Common.
R. canina *L.*—Common.
R. arvensis *Huds.*—Common.
Pyrus Aucuparia *Ehrh.*—Simmonswood Moss.
P. Malus *L.*—Hoole, Hesketh Bank.
Cratægus Oxyacantha *L.*

Saxifrageæ.

Saxifraga tridactylites *L.*—Sandhills, frequent.
S. granulata *L.*—West Derby, Woolton.
Chrysosplenium oppositifolium *L.*—Scarisbrick park
Parnassia palustris *L.*—Frequent.
Ribes alpinum *L.*—Denizen, Burscough Priory.

Crassulaceæ.

Cotyledon Umbilicus *L.*—Aughton.
Sedum Telephium *L.*—Fazakerly.
S. acre *L.*—Sandhills, common.

Droseraceæ.

Drosera rotundifolia *L.*—Sandhills.
D. intermedia *Hayne.*—Rainford Moss

Haloragеæ.

Hippuris vulgaris *L.*—Southport.
Myriophyllum verticillatum *L.*—Headbolt-lane, Formby.
M. spicatum *L.*—Frequent.
M. alterniflorum *D.C.*—Ditches, Southport.
Callitriche stagnalis *Scop.*—Frequent, ditches.
C. hamulata *Kuetz.*—Frequent, ditches.

LYTHRARIÆ.

Peplis Portula *L.*—Martin Mere, rare.
Lythrum Salicaria *L.*—Ditches.

ONAGRARIEÆ.

Epilobium angustifolium *L.*—Kirby Moss. Formby sandhills.
E. hirsutum *L.*—Common.
E. parviflorum *Screb.*—Frequent.
E. montanum *L.*—Common.
E. palustre *L.*—Occasional.
Œnothera biennis *L.* Formby, Freshfield.
Circæa lutetiana *L.*—Croxteth Woods.

UMBELLIFERÆ.

Hydrocotyle vulgaris *L.*—Common, sandhills.
Eryngium maritimum *L.*—Sandhills, frequent.
Sanicula europæa *L.*—Woods.
Conium maculatum *L.*—Occasional.
Bupleurum rotundifolium *L.*—Casual.
Apium graveolens *L.*—Sandhills, common.
A. nodiflorum *Reich. fil.*—Ditches, common.
A. inundatum *Reich. fil.*—Ditches, common.
Sium erectum *Huds.*—Freshfield.
Ægopodium Podagraria *L.*—Common.
Conopodium denudatum *Koch.*—Fields and open woods, common.
Myrrhis Odorata *Scop.*—Lathom, Burscough, Maghull.
Chærophyllum temulum *L.*—Common.
Scandix Pecten-veneris *L.*—Nr. Hightown Station.
Anthriscus vulgaris *Bernh.*—Common.
A. sylvestris *Hoffm.*—Common.
Fœniculum vulgare *Mill.*—Occasional.
Œnanthe fistulosa *L.*—Frequent.
Œ. Lachenalii *C. Gmel.*—Frequent.
Œ. crocata *L.*—Frequent.
Œ. Phellandrium *L.*—Common.
Æthusa Cynapium *L.*—Cultivated ground.
Angelica sylvestris *L.*—Watery places.

Peucedanum sativum *B. & H. F.*—Birkdale, Southport sandhills.
Heracleum Sphondylium *L.* --Common.
Daucus Carota *L.*—Dry fields, common.
Caucalis arvensis *Huds.*
C. infesta *Sprng.*—(Torilis infesta) Cornfields, rare.
C. Anthriscus *Huds.*—Frequent.
C. nodosa *Scop.*—Occasional.

ARALIACEÆ.

Hedera Helix *L.*—Hedge banks, woods, old walls.

CORONACEÆ.

Cornus sanguinea *L.*—Woods at Little Crosby, planted.

CAPRIFOLIACEÆ.

Adoxa Moschatellina *L.*—Bescar Lane, Hesketh Bank.
Sambucus nigra *L.*—Common.
Viburnum Opulus *L.* —Occasional, planted.
Lonicera Periclymenum *L.*—Thickets, common.

RUBIACEÆ.

Galium Cruciata *Scop.*—Sandhills, rare.
G. verum *L.*—Common.
G. saxatile *L.*—Common.
G. palustre *Poll.*—Common.
G. Aparine *L.*—Common.
Sherardia arvensis *L.*—Dry fields.

VALERIANEÆ.

Valeriana dioica *L.*—Hoole.
V. Sambucifolia *Willd.*—Sefton.
Valerianella olitoria *Poll.*—Common, moss land.

DIPSACEÆ.

Scabiosa Succisa *L.*—Common.
S. arvensis *L.*—Crosby.

COMPOSITÆ.

Solidago Virgaurea *L.*—Frequent, Parbold.
Bellis Perennis *L.*—Everywhere.
Aster Tripolium *L.*—Salt marshes.
Erigeron acre *L.*—Sandhills, frequent.
Filago minima *Fr.*—Occasional.
Antennaria dioica *R. Br.*—Birkdale sandhills.
Gnaphalium uliginosum *L.*—Common.
G. sylvaticum *L.*—Knowsley, Ormskirk.
Pulicaria dysenterica *Gaertn.*—Birkdale. Mouth of the Alt.
Bidens cernua *L.*—Ditches, common.
B. tripartita *L.*—Ditches, common.
Achillea Millefolium *L.*—Common.
A. Ptarmica *L.*—Moss land, common.
Chrysanthemum segetum *L.*—Occasional.
C. Leucanthemum *L.*—Common.
C. parthenium *Pers.*—Occasional, escape from cultivation.
Matricaria inodora *L.*—Common.
M. Chamomilla *L.*—Occasional.
Anthemis arvensis *L.*—Waste places.
Tanacetum vulgare *L.*—Hightown, Kew, Formby.
Tussilago Farfara *L.*—Common.
Senecio vulgaris *L.*—Common.
S. sylvaticus *L.*—Common.
S. viscosus *L.*—Southport, rare.
S. Jacobæa *L.*—Common.
S. aquaticus *Huds.*—Common.
Carlina vulgaris *L.*—Frequent, sandhills.
Carduus pycnocephalus *L.*—Frequent, sandy ground.
Cnicus lanceolatus *Willd.*—Common.
C. palustris *Willd.*—Common.
C. arvensis *Hoffm.*—Common.
Mariana lactea *Hill.*—Waste ground, occasional.
Centaurea nigra *L.*—Common.
C. Scabiosa *L.*—Between Ormskirk and Rainford.
C. Cyanus *L.*—Cornfields, occasional.
Cichorium Intybus *L.*—Occasional.

Lapsana communis *L.*—Common.
Crepis virens *L.*—Common.
Hieracium Pilosella *L.*—Common.
H. umbellatum *L.*—Common.
Hypochœris glabra *L.*—Rare, Freshfield.
H. radicata *L.*—Common.
Leontodon hirtus *L.*—Sandhills.
L. autumnalis *L.*—Common.
Taraxacum officinale *Web.*—Common.
T. palustre *D.C.*—Common, sandhills.
Lactuca muralis *Fresen.*—Ince, Billinge, Sefton.
Sonchus oleraceus *L.*—Common.
S. asper *Hoffm.*—Common.
S. arvensis *L.*—Cultivated fields.
Tragopogon pratense *L.*—Occasional.

Campanulaceæ.

Wahlenbergia hederacea *Reichb.*—Lathom Park and Halsall. Reputed from Holland.
Campanula latifolia *L.*—Lathom, Burscough.
C. rapunculoides *L.*—Hill House.
C. rotundifolia *L.*—Common, sandhills.

Vacciniaceæ.

Vaccinium Myrtillus *L.*—Simmonswood.
Schollera Oxycoccos *Roth.*—Simmonswood Moss.

Ericaceæ.

Andromeda Polifolia *L.*—Simmonswood Moss, plentiful.
Calluna Erica *D.C.*—Common upon the moss.
Erica Tetralix *L.*— do.
E. cinerea *L.*— do.
Pyrola rotundifolia *var. maritima.*—Kenyon.

Monotropeæ.

Hypopithys monotropa *Crantz.*—Sandhills from Hightown to Birkdale.

Plumbagineæ.

Statice Limonium *L.*—Muddy places on the shore.
Armeria maritima *Willd.*—Common.

Primulaceæ.

Hottonia palustris *L.* -Frequent in ditches inland.
Primula acaulis *L.*—Hesketh Bank, Hoole.
P. veris *L.*—Hundred End.
Lysimachia vulgaris *L.*—Frequent, marshy ground.
L. Nummularia *L.*—Simmonswood Moss.
L. nemorum *L.*—Woods and shady places.
Glaux maritima *L.*—Frequent near the sea.
Anagallis arvensis *L.*—Sandhills, common.
A. cærulea *Schreb.*—Occasional.
A. tenella *L.*—Sandhills.
Centunculus minimus *L.*—Damp places, rare. Formby, Ainsdale.
Samolus Valerandi *L.*—Sandhills.

Oleaceæ.

Fraxinus excelsior *L.*—Planted.
Ligustrum vulgare *L.*—Sandhills, frequent.

Apocynaceæ.

Vinca minor *L.*—Reported from Ormskirk.

Gentianeæ.

Blackstonia perfoliata *Huds.* (*Chlora perfoliata*).—Sandhills, frequent.
Erythræa Centaurium *Pers.*—Sandhills, common.
E. Latifolia *Sm.*—Very rare.
E. littoralis *Fr.*—Sandhills, frequent.
E. pulchella *Fr.*—Sandhills, frequent.
Gentiana Pneumonanthe *L.*—Woodvale.
G. Amarella *L.*—Sandy ground.
G. campestris *L.*—Sandy ground.
Menyanthes trifoliata *L.*—Marshes.

Boragineæ.

Cynoglossum officinale *L.*—Sandhills.
Asperugo procumbens *L.*—Reported from Aintree.
Smyphytum officinale *L.*—Crosby, Melling.
Lycopsis arvensis *L.*—Sandy fields.
Myosotis cæspitosa *F. Schultz.*—Ditches.
M. **palustris** *Relh.*—Ditches.
M. **sylvatica** *Hoffm.*—Croxteth woods.
M. **arvensis** *Lam.*—Inland, common.
M. **collina** *Hoffm.*—Sandhills.
M. **versicolor** *Reichb.*—Common.
Echium vulgare *L.*—Common.

Convolvulaceæ.

Volvulus sepium *Junger.*—Hedges, frequent.
V. **Soldanella** *Junger.*—Sandhills, rare.
Convolvulus arvensis *L.*—Common.
Cusuta Epithymum *Murr.*—Occasional.

Solanaceæ.

Solanum nigrum *L.*—Formby, waste ground.
Lycium barbarum *L.*—Occasional, sandhills.
Datura Stramonium *L.*—Waste places, occasional.
Hyoscyamus niger *L.*—Waste places, occasional.

Scrophularineæ.

Verbascum Thapsus *L.*—Waste places, sandhills.
Linaria Cymbalaria *Mill.*—Halsall.
L. **vulgaris** *Mill.*—Common.
Scrophularia nodosa *L.*—Hesketh Bank.
Mimulus Luteus *L.*—Halsall.
Limosella aquatica *L.*—Burscough mill dam.
Digitalis purpurea *L.*—Longton.
Veronica hederæfolia *L.*—Common.
V. **polita** *Fr.*—Frequent.
V. **agrestis** *L.*
V. **Buxbaumii** *Ten., now Tournefortii, C. Gmel.*—Sefton.
V. **arvensis** *L.*—Common.

V. serpyllifolia *L.*—Common.
V. officinalis *L.*—Common.
V. Chamædrys *L.*—Common.
V. montana *L.*—Upholland, Billinge.
V. scutellata *L.*—Boggy places.
V. Anagallis-aquatica *L.*—Boggy places.
V. Beccabunga *L.*—Boggy places.
Euphrasia officinalis *L.*—Common.
Bartsia Odontites *Huds.*—Common.
B. viscosa *L.*—Between Halsall and Woodvale.
Pedicularis palustris *L.*—Sandhills.
P. sylvatica *L.*—Wet meadows, Hoole.
Rhinanthus Crista-galli *L.*—Meadows, sandhills, common.
Melampyrum pratense *L.*—Woods, shady places, occasional.

Orobanchaceæ.

Orobanche major *L.*—Allerton.
O. minor *Sm.*—Scarisbrick.

Lentibularieæ.

Utricularia vulgaris *L.*—Ditches.
U. minor *L.*—Ditches.
Pinguicula vulgaris *L.*—Simmonswood Moss.

Labiatæ.

Mentha piperita *L.*—Damp places, occasional.
M. hirsuta *Huds.*—Damp hollows, sandhills.
M. sativa *L.*—Wet places, frequent.
M. rubra *Sm.*—Maghull, Lydiate.
M. arvensis *L.*—Common.
Lycopus europæus *L.*—Halsall.
Thymus serpyllum *Fr.*—Sandhills, common.
Nepeta Cataria *L.*—Reported from Aintree.
Scutellaria galericulata *L.*—Swampy ground, occasional.
S. minor *Huds.*—Formby, Knowsley.
Prunella vulgaris *L.*—Common.
Marrubium vulgare *L.*—Occasional.

Stachys Palustris *L.*—Frequent.
S. sylvatica *L.*—Common.
S. arvensis *L.*—Waste ground, frequent.
Galeopsis Tetrahit *L.*—Common.
G. versicolor *Curt.*—Hillhouse.
Leonurus Cardiaca *L.*—Occasional, Churchtown.
Lamium amplexicaule *L.*—Waste ground, frequent.
L. maculatum *L.*—Allerton.
L. album *L.*—Roe-lane.
Ballota nigra *L.*—Common.
Teucrium Scorodonia *L.*—Common.
Ajuga reptans *L.*—Frequent.

PLANTAGINEÆ.

Plantago major *L.*—Common.
P. lanceolata *L.*—Common.
P. maritima *L.*—Common.
P. Coronopus *L.*—Common.
Littorella juncea *Berg.*—Crosby Marsh, Formby.

CHENOPODIACEÆ.—

Chenopodium album *L.*—Common.
C. murale *L.*—Occasional.
C. rubrum *L.*—Frequent
C. Bonus-Henricus *L.*—Halsall.
Atriplex littoralis *L.*—Southport.
A. patula *L.*—Common.
A. Babingtonii *Woods.*—Frequent.
A. portulacoides *L.*—Occasional.
Salicornia Herbacea *L.*—Muddy places, frequent.
Suæda maritima *Dum.*—Muddy places, frequent.
Salsola Kali *L.*—Shore, common.

POLYGONACEÆ.

Polygonum Convolvulus *L.*—Common.
P. aviculare *L.*
P. Raii *Bab.*—Crosby, Southport.
P. Hydropiper *L.*—Wet places.
P. minus *Huds.*—Simmonswood to Kirkby.
P. Persicaria *L.*—Common.
P. lapathifolium *L.*—Common.

P. **amphibium** *L.*—Frequent.
P. **Bistorta** *L.*—Frequent.
Fagopyrum esculentum *Moench.*—Occasional.
Rumex conglomeratus *Murr.*—Frequent.
R. **sanguineus** *L.*—Occasional.
R. **maritimus** *L.*—Halsall Moss.
R. **obtusifolius** *L.*—Occasional.
R. **acutus** *L.*—Occasional.
R. **crispus** *L.*—Common.
R. **Hydrolapathum** *Huds.*—Halsall Moss.
R. **Acetosa** *L.*—Common.
R. **Acetosella** *L.*—Common.

ELAEAGNACEÆ.

Hippophæ rhamnoides *L.*—Sandhills. planted.

EUPHORBIACEÆ.

Euphorbia Helioscopia *L.*—Common.
E. **Paralias** *L.*—Sandhills, common.
E. **portlandica** *L.*—Sandhills, common.
E. **Peplus** *L.*—Sandhills, common.
E. **exigua** *L.*—Occasional.
E. **Lathyris** *L.*—Occasional.
Mercurialis perennis *L.*—Common.

URTICACEÆ.

Ulmus montana *Stokes.* Hedgerows. planted.
U. **campestris** *Sm.*—Hedgerows, planted.
Humulus Lupulus *L.*—Hedges, nearvillages, frequent.
Urtica dioica *L.*—Common.
U. **urens** *L.*—Common.
Parietaria officinalis *L.*—Ashurst Beacon, Lydiate.

MYRICACEÆ.

Myrica Gale *L.*—Halsall Moss.

CUPULIFERÆ.

Betula Verrucosa *Ehrh.*—Moss land not under the plough.

Alnus glutinosa *Medic.*—Halsall Moss, damp woods.
Corylus Avellana *L.*—Hesketh Bank, Longton.
Quercus Robur *L.*—Woods and hedgerows.

Salicineæ.

Populus tremula *L.*—Barton Moss.
Salix pentandra *L.*—Sandhills, occasional.
S. **fragilis** *L.*—Moss-lane, Formby.
S. **alba** *L.*—Frequent.
S. **cinerea** *L.*—Common.
S. **aurita** *L.*—Common.
S. **Caprea** *L.*—Common.
S. **repens.**—Common.
S. **phylicifolia** *var. argentea Sm.*—Maghull.
S. **nigricans** *Sm.*—Southport.
S. **viminalis** *L.*—Common.
S. **purpurea** *L.*—Hightown, freshfield.

Ceratophylleæ.

Ceratophyllum demersum *L.*—Formby marshes.
C. **submersum** *L.*—Altcar marshes.

Hydrocharideæ.

Elodea canadensis *Michx.*—Boundary Brook.
Hydrocharis Morsus-ranæ *L.*—Frequent.
Stratoites Aloides *L.*—Longton, gravel pits.

Orchideæ.

Neottia Nidus-avis *Rich.*—Upholland, Lathom Park.
Listera ovata *R. Br.*—Common.

Spiranthes autumnalis *Rich.*—This interesting plant formerly grew in great abundance where Eastbank-street is now situated.

Epipactis latifolia *All.*—Occasional.
E. **palustris** *Crantz.*—Abundant.
Orchis pyramidalis *L.*— Reported from Freshfield.
O. **Morio** *L.*—Meadow edges; frequent.
O. **mascula** *L.*—Meadows, woods, frequent.
O. **incarnata** *L.*—Sandhills, common.

O. latifolia *L.*—Sandhills, common.
O. masculata *L.*—Hesketh Bank, Hoole.
Ophrys apifera *Huds.*—Reported from Crosby.
Habenaria conopsea *Benth.*—Scarisbrick, 1902.
H. viridis *R. Br.*—Rare.
H. bifolia *R. Br.*—Rare.

Irideæ.

Iris pseudacorus *L.*—Common.

Amaryllideæ.

Narcissus pseudo-narcissus *L.*—Fazakerly, Halewood.

Liliaceæ.

Asparagus officinalis *L.*—Naturalized upon the sandhills, cultivated extensively at Formby.
Allium ampeloprasum *L.*—Formby.
A. ursinum *L.*—Scarisbrick.
Scilla Festalis, *Salisb.* Woods, hedge banks.
Ornithogalum umbellatum *L.*—Formby, Altcar.
Narthecium Ossifragum *Huds.*—Barton Moss.

Juncaceæ.

Juncus bufonius *L.*—Common.
J. squarrosus *L.*—Barton Moss.
J. Gerardi *Loisel.*—Salt marshes.
J. glaucus *Leers.*—Common.
J. effusus *L.*—Common.
J. conglomeratus *L.*—Common.
J. maritimus *Lam.*—Occasional.
J. lampocarpus *Ehrr.*—Common.
J. acutus *L.*—Common.
Luzula vernalis *D.C.*—Frequent.
L. campestris *D.C.*—Common.
L. erecta *Desv.*—Common.
L. maxima *D.C.*—Woods, shady places,

Typhaceæ.

Typha latifolia *L.*—Ditches, common.
T. angustifolia *L.*—Rufford.
Sparganium ramosum *Huds.*—Common.
S. simplex *Huds.*—Common.
S. minimum *Fr.*—Rare.

Lemnaceæ.

Lemna trisulca *L.*—Ponds, common.
L. minor *L.*—Ponds, common.
L. gibba *L.*—Ponds, common.
L. polyrrhiza *L.*—Occasional.

Alismaceæ.

Alisma Plantago-aquatica *L.*—Common.
A. ranunculoides *L.*—Frequent.
Butomus umbellatus *L.*—Rufford, Formby.

Naiadaceæ.

Triglochin palustre *L.*—Marshy places, common.
T. maritimum *L.*—Common.
Potamogeton natans *L.*—Common.
P. polygonifolius *Pour.*—Rare.
P. fluitans *Roth.*—Altcar, Formby.
P. heterophyllus *Schreb.*—Freshfield.
P. lucens L Rare.
P. perfoliatus *L.*—Halsall.
P. obtusifolius *M & K.*—Occasional.
P. Pusillus *L.*—Frequent.
P. Pectinatus *L.*—Occasional.
Ruppia spiralis *Hartm.*—Crosby, occasional.
Zannichellia palustris *L.*—Common, ditches.
Z. pedunculata *Reichb.*—Ditches, rare.
Zostera marina *L.*—Mouth of the Alt, rare.

Cyperaceæ.

Eleocharis acicularis *R. Br.*—Rare, sandhills.
E. palustris *R. Br.*—Common.

E. uniglumis *Reichb.*—Wet places.
E. multicaulis *Sm.*—Occasional.
Scirpus pauciflorus *Lightf.*—Occasional.
S. cæspitosus *L.*—Formby, occasional.
S. fluitans *L.*—Martin mere.
S. Savii *S. & M.*—Birkdale, Altcar.
S. setaceus *L.*—Common.
S. Tabernaemontani *Gmel.*—Rare.
S. maritimus *L.*—Common.
S. sylvaticus *L.*—Lathom.
S. Caricis *Retz.*—Rare.
S. Rufus *Schrad.*—Altcar.
Eriophorum vaginatum *L.*—Simmonswood Moss.
E. angustifolium *Roth.*—Frequent.
E. latifolium *Hoppe.*—Occasional.
Rhynchospora alba *Vahl.*—Simmonswood Moss.
Carex pulicaris *L.*—Formby marshes.
C. disticha *Huds.*—Occasional.
C. arenaria *L.*—Common.
C. teretiuscula *Good.*—Altcar, rare.
C. paniculata *L.*—Boggy places, Barton Moss.
C. vulpina *L.*—Burscough.
C. muricata *L.*—Occasional.
C. stellulata *Good.*—Simmonswood Moss.
C. remota *L.*—Frequent.
C. curta *Good.*—Rainford Moss.
C. ovalis *Good.*—Common.
C. stricta *Good.*—Rare.
C. acuta *L.*—Halewood, rare.
C. Goodenowii *J. Gay.*—Simmonswood Moss.
C. glauca *Scop.*—Common.
C. pilulifera *L.*—Simmonswood Moss.
C. præcox *Jacq.*—Damp places, rare.
C. pallescens *L.*—Formby, Crosby.
C. panicea *L.*—Damp meadows.
C. pendula *Huds.*—Rare.
C. sylvatica *Huds.*—Frequent.
C. lævigata *Sm.*—Common.
C. distans *L.*—River Alt.
C. extensa *Good.*—Mouth of the Alt.

C. **flava** *L.*—Rare.
C. **Œderi** *Retz.*—Headbolt-lane, Formby.
C. **hirta** *L.*—Occasional.
C. **Pseudo-cyperus** *L.*—Common.
C. **paludosa** *Good.*—Lydiate.
C. **riparia** *Curt.*—Frequent.
C. **rostrata** *Stokes.*—Formby to Haskayne.

NOTE.—The Cyperaes are named after Babbington's arrangement.

GRAMINEÆ.

Setaria viridis *Beauv.* — Occasional, in gardens, casual.
Phalaris canariensis *L.*—Occasional, casual.
P. **arundinacea** *L.*—Ditches common.
Anthoxanthum odoratum *L.*—Common.
Alopecurus agrestis *L.*—Waste places, occasional.
A. **myosuroides** *Huds.*
A. **geniculatus** *L.*—Common.
A. **pratensis** *L.*—Common.
Phleum pratense *L.*—Common.
P. **arenarium** *L.*—Common.
Agrostis canina *L.*—Common.
A. **palustris** *Huds.*—Common.
A. **vulgaris** *With.*—Common.
Calamagrostis epigeios *Roth.* (*Arundo epigejos*).—Occasional.
C. **lanceolata** *Roth.*—Common.
Ammophila arundinacea *Host.* (*Psamma arenaria*).—Common. Frequently planted at great cost in order to fix the land.
Aira caryophyllea *L.*—Common.
A. **præcox** *L.*—Common.
Deschampsia cæspitosa *Beauv.* Common.
D. **flexuosa** *Trin.*—Common.
Holcus mollis *L.*—Common.
H. **lanatus** *L.*—Common.
Trisetum pratense *Pers.*—Occasional.
Avena fatua *L.*—Cornfields, alien.
Arrhenatherum avenaceum *Beauv.* —Common.

Sieglingia decumbens *Bernh.*—Frequent.
Phragmites communis *Trin.*—Common.
Cynosurus cristatus *L.*—Common.
Molinia varia *Schrank.*—Simmonswood Moss.
Catabrosa aquatica *Beauv.*—Ditches, inland.
Melica uniflora *Retz.*—Lathom.
Dactylis glomerata *L.*—Common.
Briza media *L.*—Leyland, dry heath, common.
Poa annua *L.*—Common.
P. **nemoralis** *L.*—Occasional.
P. **pratensis** *L.*—Common.
P. **trivialis** *L.*—Common.
Glyceria fluitans *R. Br.*—Common.
G. **aquatica** *Sm.*—Frequent.
G. **maritima** *M. & K.*—Frequent.
G. **distans** *Wahl.*—Occasional.
Festuca rigida *Kunth.*—Occasional.
F. **uniglumis** *Sol.*—Formby, Southport.
F. **Myuros** *L.*—Formby, Southport.
F. **ovina** *L.*—Common.
F. **rubra** *L.*—Frequent.
F. **elatior** *L.*—Bath wood, Ormskirk.
F. **arundinacea** *Schreb.*—Damp places, common.
Bromus giganteus *L.*—Rare.
B. **ramosus** *Huds.*—Occasional.
B. **sterilis** *L.*—Common.
B. **commutatus** *Schrad.*—Frequent.
B. **mollis** *L.*—Common.
Brachypodium gracile *Beauv.*—Common.
Lolium perenne *L.*—Common.
L. **temulentum** *L.*—Waste ground, casual.
Agropyron caninum *Beauv.*—Rare.
A. **repens** *Beauv.*—Common.
A. **acutum** *R. & S.*—Rare.
A. **junceum** *Beauv.*—Sea shore high water mark.
Lepturus filiformis *Trin.*—Rare, New Inn.
Hordeum sylvaticum *Huds.*—Bath wood, Ormskirk.
H. **murinum** *L.*—Frequent.
H. **marinum** *Huds.*—Sandhills.
Elymus arenarius *L.*—Blundellsands.

Filices.

Pteris aquilina *L.*—Common upon the moss.
Lomaria spicant *Desv.*—Simmonswood, Kirkby.
Asplenium Adiantum-nigrum *L.*—Sefton Church.
A. Trichomanes *L.*—Upholland, Lathom Park.
A. Ruta-muraria *L.*—Parbold, Halsall Church.
Athyrium Filix-foemina *Roth.*—Damp woods, frequent.
Scolopendrium vulgare *Sym.* — Banks, Hesketh Bank, Longton.
Cystopteris fragilis *Bernh.*—Ince station.
Polystichum angulare *Presl.*—Fazakerly, Sefton.
Lastrea Oreopteris *Presl.* — Simmonswood Moss, Skelmersdale.
L. Filix-mas *Presl.*—Common.
L. dilatata *Presl.*—Common.
L. spinulosa *Presl.*—Barton Moss, rare.
Polypodium vulgare *L.*—Hesketh Bank, Longton.
Phegopteris Dryopteris *Fee.*—Upholland.
Osmunda regalis *L.*—Barton Moss.
Ophioglossum vulgatum *L.*—Altcar, sandhills.
Botrychium Lunaria *Sw.*—Pastures, occasional.

Equisetaceæ.

Equisetum maximum *L.*—Sefton.
E. arvense *L.*—Common.
E. sylvaticum *L.*—Billinge Hill, Melling, Ashurst Beacon.
E. palustre *L.*—Common.
E. limosum *Sm.*—Common.
E. variegatum *Schleich.*—Sandhills, frequent.

Lycopodiaceæ.

Lycopodium Selago *L.*—Seaside, Simmonswood Moss.
L. inundatum *L.*—Formby, sandhills.
L. clavatum *L.*—Seaside, Simmonswood Moss.

Selaginellaceæ.

Selaginella selaginoides *Gray.*—Sandhills, rare.

MARSILEACEÆ.

Pilularia globulifera *L.*—Formby Marsh.

CHARACEÆ.

Chara hispida *L.*—Birkdale.
C. vulgaris *L.*—Common.
Nitella Flexilis *Agardh.*—Crosby, rare.

HYPOPITYS MONOTROPA CRANTZ.

BY HENRY BALL.

Hypopitys Monotropa, Crantz, commonly called the Yellow Bird's Nest, is an inhabitant of our sandy valleys which deservedly demands more than a passing notice. For the benefit of the general reader, it is necessary to give a description of the plant and an explanation of the botanical problem which it presents. This interesting species makes its appearance each year in July and August. It grows to the height of seven or eight inches, and, when it first appears above the surface of the ground, looks much like a stick coated with pale yellow wax, and studded with scales of the same tint. In addition to its tissues being entirely destitute of green colouring matter (chlorophyll), its form is peculiar; its stem is bent like a pot-hook; its flower-bearing, terminal portion pointing downwards. This curve gradually lessens until the plant becomes nearly erect by the time the flowers are expanded, and as the plant advances in age it is quite straight, the fruit being held aloft upon an upright stem, now changed in colour to a dingy brown. Interesting as the parts of the plant above ground certainly are, those below ground are even more so. Its thread-like and intertwining roots have become specialized. They are invariably interwoven with a low, byssoid fungus. The exact nature of the connection between the plant and the fungus and dead leaves amongst which its roots pass, has given rise to great diversity of opinion

amongst botanists. The opinions expressed in regard to its manner of growth, and method of obtaining nourishment, are as varied as they are numerous. Loudon, Sowerby and Kerner describe it as parasitic; Rylands and Babbington as non-parasitic, Sachs as saprophytic.

Even taking into account all that has been written by these and other authorities on the subject, the plant still remains a mystery. Kerner, who decides upon the parasitic view, states that the Yellow Bird's Nest and the fungus are organically united, that is, their tissues are interpenetrated, and the juices flow from one to the other. If Kerner is right, then Sachs must be wrong, for he, regarding the plant as a saprophyte, explains that such plants derive their sustenance from decaying vegetable matter only, and not from living tissues. Assuming that Kerner is correct, one asks—"Why should a phanerogam make use of a cryptogam as a host? What becomes of the host and its parasite during the winter cold? Do the underground stems of *Monotropa* migrate to fresh colonies of fungi, or do they invariably die and future generations arise from seeds only?"

These are some of the queries which present themselves to the student as he considers this extraordinary plant.

It grows on our sand dunes in such profusion that its examination becomes fairly easy.

The soil is clean and sandy, and the fungus and attached plant are easily raised out of the ground without injury. It would form a fitting subject for exhaustive enquiry by members attending section K. of the British Association, and it would make a not unworthy object for a subsequent visit by individuals sufficiently interested in plant biology when next year it appears again in flower.

If Kerner's theory can be thoroughly established this is clearly a case of symbiosis, and a new fact in the history of British Phanerogams is established. Root parasites, such as Broom-rape and Toothwort, are well-known and easily understood; but in *Monotropa* the case is entirely different and probably unique.

THE MOSSES OF THE DISTRICT.

By J. A. Wheldon, F.L.S.

The first important contribution to the bryology of the district was contained in Dickinson's *Flora of Liverpool* (1851), most of the records for mosses being supplied by Messrs. William Harrison, William Skelborne, Robert Tudor, and T. Sansom. Subsequently these workers were reinforced by F. P. Marrat, who, aided by William Wilson, of Warrington, and John Nowell, of Todmorden, worked out both mosses and liverworts very completely, the result of his labours appearing in 1855 under the title of *The Mosses and Hepaticæ of Liverpool and Southport*.

The Phytologist for 1857 contained Dr. J. B. Wood's paper on *The Bryology of Southport*, and subsequently he detected one of our rarest British mosses *(Bryum Neodamense)* in the vicinity. Others who have done good work within our area in the past are Messrs. Percival, Higgins, Whitehead, Hunt, Wild, Burgess, and last but not least, G. A. Holt. After Marrat's Liverpool list appeared bryology seems to have been neglected in that city, subsequent interesting discoveries being reported by Manchester botanists principally. None of the later Floras or Supplements issued by the Liverpool Naturalist Society contain any reference to the mosses, an omission which is to be regretted.

A few new stations for the rarer species were recorded in my two papers on the *Mosses of South Lancashire* (*Journal of Botany*, 1899 and 1900); and in the preparation of the later list I received valuable help from Mr. J. Cash and Mr. G. A. Holt.

Speaking generally, the district is unfavourable for the production of a great variety of species. The lithological features are not much varied, a great proportion of the land is highly cultivated, the streams are few, slow, and ditchlike, with muddy and not rocky beds; and on the landside our area is surrounded by a belt of populous towns, which yearly encroach more on the country. There are no hills exceeding 500 feet in altitude, no dysgeogenous rocks, so much appreciated by mosses, and

no forest tracts. The wealth of species found on the sandhills alone saves our list from being absolutely commonplace. Unfortunately, this delightful resort of the botanist is rapidly being either built upon, "improved" by conversion into asphalte promenades, or drained and trimmed into golf links. These changes have resulted in the extermination of several well known Southport rarities, and there can be little doubt that others will shortly share the same fate. Most of the best collecting ground on the north sandhills has been built over, but a few good plants still linger on land already bespoken for building purposes. When plants mentioned in the following list are known to be extinct, or where recent search has failed to discover them, the record will be enclosed in brackets.

Sphagnum fimbriatum *Wils.*—Rainford and Parr Mosses, Marrat. (Warbreck Moor, Higgins and Marrat).

S. acutifolium *R. & W.*—(Rainford Moss, Marrat. Simmonswood, Harrison.)

S. subnitens *R. & W.*—Not unfrequent on the mosses.

var. **virescens** *Warnst.*—Barton Moss.

S. squarrosum *Pers.*—Rainford Moss, Higgins.

var. **spectabile** *Russ.*—Boggy Carr near Netherton, fruiting.

var. **imbricatum** *Schimp.*—With the last named.

S. teres *Augstr.* vars. **squarrosulum** *Warnst*, and **subsquarrosum** *Warnst.*—Abundant in the Carr near Netherton.

S. cuspidatum *R. & W.*—Rainford and Simmonswood, Harrison and Skelhorne. (Crosby, Tudor. Walton Junction, Gasking.)

S. obtusum *Warnst.*—Very fine in the Netherton Carr.

S. recurvum *R. & W.* vars. **amblyphyllum** *W.*, and **mucronatum** *W.*—Netherton, and in less quantity on the mosses.

S. rufescens *Warnst.*—Sparingly at Netherton. (The Sphagnum contortum reported from Warbreck

Moor by Marrat, and now lost, was probably this species.)

S. turfaceum *Warnst.*—Rainford Moss.

S. cymbifolium *Warnst.*—(Most Lancashire bogs, Marrat). Probably confused with the next by the older botanists.

S. papillosum *Lindb.* var. **normale** *Warnst.* Simmonswood Moss, Barton Moss.

Tetraphis pellucida *Hedw.*—Knowsley Park, Bold Park, Rainford Moss, &c., Higgins and Marrat.

Catharinea undulata W. & M.—Very common and fruits freely.

var. **Haussknechtii** *Dixon.*—By claypits on Warbreck Moor.

Polytrichum piliferum *Schreb.*—Rainhill, Rev. H. H. Higgins. Southport, Marrat. More common than the next.

P. juniperinum *Willd.*—Frequent, Warbreck Moor, Simmonswood Moss, Hightown and Ainsdale.

P. formosum *Hedw.*—No records for this common species.

P. gracile *Dicks.*—Rainford Moss, fruiting abundantly, Beesley and Wheldon, 1903.

P. commune *L.*—Frequent on the mosses.

var. **perigoniale.**—Rainford Moss, in fruit, Beesley and Wheldon.

var. **fastigiatum** *Wils.*—Barton Moss.

P. aloides *Hedw.*—Kirkby Moss, and in old quarries, &c.

P. urnigerum *L.*—Quarry near Kirkby.

Pleuridium alternifolium *Rab.*—(Near Liverpool. Taylor in Hook. British Flora.)

Ditrichum flexicaule *Hpe.*—Southport sands, Marrat. Crosby, Skelhorne. Formby.

Swartzia montana *Lindb.*—(Rainford Moss, Skelhorne. It is probable that this was an error.)

Ceratodon purpureus *Brid.*—Very common.

Dichodontium pellucidum *Schimp.*—Mill sluice near Kirkby, Beesley and Wheldon, 1903.

Dicranella heteromalla *Schimp.*—Very common.

var. **interrupta** *B. & S.*—Sandpit near Rainford.

D. cerviculata *Schimp.*—Abundant on the bare banks of cuttings, on Rainford, Simmonswood and Kirkby Mosses.

var. **pusilla** *Schimp.*—Kirkby Moss.

D. rufescens *Schimp.*—Rainhill, Marrat.

D. varia *Schimp.*—Frequent on damp clay. Very fine on the banks of the Alt near Hightown, on Warbreck Moor, and near Burscough.

Dicranoweissia cirrata *Ldb.*—Not common, and usually stunted and barren. West Derby, Skellon (Smithdown Lane, Marrat).

Camphyliopus flexuosus *Brid.*—Simmonswood Moss, Harrison.

C. pyriformis *Brid.*—Rainford Moss, Marrat, Simmonswood Moss, fruiting.

Dicranum scoparium *Brid.*—Thinly scattered over the district, but not abundant.

var. **orthophyllum** *Brid.*—Hightown and Formby.

var. **ericetorum** *Corbiere.*—Barton Moss.

D. Bonjeanii *De Not.*—Simmonswood Moss, Harrison. Knowsley, Marrat. Upholland, and near Rainford.

Leucobryum glaucum *Schimp.*—Rare. Simmonswood, Sansom.

Fissidens exilis *Hedw.*—near Walton Junction.

F. Lylei *Wilson.*—Gillbrook, Marrat. Delph, near the station, and in the mill sluice, Kirkby, Beesley and Wheldon, 1903.

F. viridulus *Wahl.*—(Between Walton and Aintree, now lost.) Longton, near Preston, F. C. King.

F. bryoides *Hedw.*—Very common, fruiting freely.

F. adiantoides *Hedw.*—Formby, Marrat, Netherton, and near Burscough Junction; in fruit on Rainford Moss, Beesley and Wheldon.

F. taxifolius *Hedw.*—Sefton, Sanson, rather frequent.

Grimmia apocarpa *Hedw.*—Occurs occasionally on walls, mostly stunted in growth.

G. pulvinata *Sm.*—Frequent on walls.

Rhacomitrium and Ptychomitrium.—Several records for these two genera are given in the older floras. but none of them have been seen recently.

Acaulon muticum *C.M.*—Rather frequent on arable land. Maghull and Kirby, Skelhorne. Walton and Litherland.

Phascum cuspidatum *Schreb.*—With the last at Walton.

var. **piliferum** *Schreb.*—Crosby, 1860, Marrat.

Pottia Heimii *Fürnr.*—South Shore. Southport. Marrat. Until recently on the north sands also; still grows about Churchtown and Crossens, sometimes in great abundance. Plentiful about Hightown.

P. truncatula *Ldb.*—Frequent throughout the district.

P. intermedia *Fürnr.*—Sparingly at Walton and near Crossens.

P. littoralis *Mitt.*—Southport, Percival. On the shore towards Crossens within reach of the tide, and on the sea bank near Churchtown.

P. minutula *Fürnr.*—Very frequent on clay banks, but often overlooked from its small size and early fruiting.

P Wilsoni *B. & S.*—Southport, 1876, Wild.

Tortula aloides *De Not.* On clay banks, and pit sides about Walton in several places.

T. rigida *Schrad.*—On mortar of a wall near Maghull.

T. muralis *Hedw.*—Very common.

T. subulata *Hedw.*—Common and fruiting freely on the sandhills both north and south of Southport.

T. ruralis *Ehrh.*—(Sandhills on both sides of the Mersey, Marrat. It is doubtful if anything but the next occurs.)

T. ruraliformis *Dixon.*—Southport, Hunt. Abundant throughout the sandhill tract from Crosby to Churchtown.

Barbula rubella *Mitt.*—Frequent inland, abundant on the sandhills.

B. tophacea *Mitt.*—Southport, Marrat. Frequent on the sandhill tract, and very fine (*forma luxurians Braithw.*) on the banks of the Alt, and inland near Walton Junction, on damp clay banks.

var. **acutifolia** *Schimp.*—Warbreck Moor.

B. fallax *Hedw.*—Frequent, mostly as the var. *brevifolia Schultz*, or approaching it.

B. vinealis *Brid.*—Southport, Marrat. Birkdale, Crossens, Hightown, and Walton.

B. rigidula *Mitt.*—Sparingly on walls near Sefton.

B. Hornschuchiana *Schultz.* A tall compact form is sparingly distributed on the sandhills between Formby and Birkdale.

B. revoluta *Brid.*—Occasionally on the sandhills and on the mortar of walls.

B. convoluta *Hedw.*—Southport, Marrat. Hightown, Lydiate, and Walton.

B. unguiculata *Hedw.*—Common.

var. **cuspidata** *Schultz.*—Walton and Melling.

Weisia squarrosa *C.M.* (Formerly grew near the railway at Walton. Station now destroyed.

Weisia microstoma *C.M.*—Still occurs near Walton, but several stations recently destroyed.

W. viridula *Hedw.* — Abundant throughout the district.

Trichostomum flavovirens *Bruch.*- Southport, 1885, Burgess and Holt.

T. tortuossum *Dixon.*—Sparingly, and in a short compact form on the sandhills near Formby.

(**T. mutabile** *Bruch.*—Occurs on both sides of the Mersey just beyond our area).

var. **littorale** *Dixon.*—Southport, J. Cash, Hall-road.

Encalypta streptocarpa *Hedw.* Sandhills on both sides of the Mersey, Skelhorne.

Ulota crispa *Brid.*—Rainhill, Higgins and Marrat.

Orthotrichum affine *Schrad.* (Warbeck Moor, Marrat.)

O. diaphanum *Schrad.*—Bold, Higgins.

Splachnum ampullaceum *L.*—(Simmonswood and Rainford Mosses, Shepherd). Not seen recently.

Tetraplodon mnioides *B. & S.*—(Rainford Moss. Skelhorne). Now extinct.

Ephemerum serratum *Hpe.*—Liverpool Botanic Gardens, Skelhorne. Fallow fields about Walton and Aintree.

Physcomitrium pyriforme *Brid.*—Occurs by ditches on the sandhills north and south of Southport. Inland on Barton Moss, and here and there on railway banks.

Funaria fascicularis *Schimp.* Near Walton. sparingly.

F. hygrometrica *Sibth.*—Very common.

var. **calvescens** *B. & S.*—Near Halsall.

Amblyodon dealbatus *P.B.*—Southport and Crosby. Marrat. Still abundant, and occurs also on the north shore where I saw it fruiting this year.

Meesia trichodes *Spruc.* Southport. Marrat. Now much less abundant than the preceding species.

Aulacomnium palustre *Schwgr.*—Formby and Simmonswood Moss, Harrison. Barton Moss, and in the Carr near Netherton, in the former locality with the *forma fasciculiaris.*

A. androgynum *Schwgr.*—Bootle, Skelhorne. Near Walton, Fisher. Now extinct.

Catoscopium nigritum *Brid.* Southport sands. Higgins. Formby, B. B. Scott. Birkdale, J. Cash. Freshfield, Capt. Cunliffe.

Bartramia pomiformis *Hedw.*—Aintree, Tudor. Dying out rapidly, but still occurs in small quantity in Black Bull-lane Walton, and near the Cottage Homes at Fazakerly, where it fruits sparingly.

Philonotis Fontana *Brid.*—Simmonswood Moss, Skellon. Near Formby.

Leptobryum pyriforme *Wils.* On pots in greenhouses, Skelhorn. Sandhills, Formby, Higgins. Birkdale and north of Southport, perhaps lost now in latter locality.

Webera nutans *Hedw.*—Very common, fruiting freely.

W. annotina *Schagr.*—Knowsley, Rainford and Walton. Barren and probably often overlooked.

var. **angustifolia** *Schimp.*—Quarry near Kirkby.

W. carnea *Schimp.*—Near Liverpool, Skelhorne. Frequent on damp clay about Walton, and at Hightown.

W. albicans *Schimp.*—Frequent in damp places.

Bryum pendulum *Schimp.*—Abundant both north and south of Southport on the sandhills, and occurs inland occasionally in sandy or gravelly places.

B. Warneum *Bland.*—Southport, Marrat and Wilson. Birkdale, Wild. Abundant in latter locality, but on the north sands has been nearly exterminated by the extension of the parade.

B. calophyllum *R. Br.*—Southport, Marrat. Occurs only on the south sands now, and is much diminished in quantity.

B. Marratii *Wils.*—(Southport, 1854, and Ainsdale, Marrat.) Not seen recently, perhaps extinct.

B. lacustre *Brid.*—Freshfield and Ainsdale, Hunt, 1860. Still plentiful, and this year a little was seen on the north sands, and at Birkdale.

B. inclinatum *Bland.*—Frequent on the sandhills, Marrat. Much less abundant than B. pendulum.

B. uliginosum *B. & S.*—Southport, Wood, 1843. Not at all common now. Seen last year by runnels in pastures opposite Churchtown, and near Hightown Rifle Range.

B. pallens *S.W.*—Common on the sandhills, Marrat. And also in wet places and by damp roadsides inland.

B. bimum *Schreb.*—(Litherland, Marrat.) Now lost. Rainford Moss, in fruit, Beesley and Wheldon.

B. pseudotriquetrum *Schwag.*—Croxteth Park, Harrison. Southport, Wild. Hightown, Netherton, and Warbreck Moor. Fruiting freely on Rainford Moss, Beesley and Wheldon.

var. **compactum** *Schp.*—Southport, 1863, Whitehead. Still occurs between Birkdale and Ainsdale.

B. neodamense *Itz.*—South of Southport, 1859, Dr. Wood. In good fruit at Ainsdale, 1875, Percival and

Rogers. Not seen for two or three years, and may have disappeared before the golf invasion.

B. intermedium *Itz.*—Frequent on the sandhills both north and south of Liverpool, and on damp sand or clay inland, especially on the sites of old brickfields.

B. cæspiticium *L.*—Walls near Ince Blundell, Sefton, and perhaps elsewhere, but not at all abundant.

Bryum capillare *L.*—Frequent on old walls and banks.

var. **rosulatum** *Mitt.*—On a tree in Knowsley Park.

B. Donianum *Grev.*—On sandstone rocks, near Kirkby.

Bryum argenteum *L.*—Very common.

var. **majus** *B. & S.*—Abundant on stonework by a sluice from the river Alt beyond Aintree.

var. **lanatum** *B. & S.*—Southport, Wild.

Bryum roseum *Schreb.*—(Bootle, Skelhorne. Lost now.) Under Salix repens at Hightown.

Mnium affine *Bland.*—Firgrove, Harrison. Altcar.

var. **elatum** *B. & S.*—Southport, Percival and Rogers. By a pit near Ince Blundell, and very fine in the boggy Carr at Netherton.

M. cuspidatum *Hedw.*—Formby and Southport, Marrat.

M. rostratum *Schrad.*—Formby, Harrison. Ainsdale, Marrat. Plantation and hedge cops near Aintree and Fazackerly.

M. undulatum *L.*—Formby, Marrat. Aintree, etc.

M. hornum *L.*—Very common throughout the district.

M. serratum *Schrad.*—Between Birkdale and Ainsdale, Marrat. I have never succeeded in finding it within our area.

M. stellure *Reich.*—Between Birkdale and Ainsdale, Marrat.

M. punctatum *L.*—Frequent in damp shady places, both inland and on the coast sandhills. Occasionally fruiting, as in the Carr at Netherton, and in Ince Blundell Woods.

Fontinalis antipyretica *L.*—(Bootle, Dickinson. Fazackerly, Harrison.) Probably long gone in both localities. Recently found in a ditch at Altcar.

Thuidium tamariscenum *B. & S.*—Not common. Formby and Hightown.

Climacium dendroides *W. & M.*—Occurs in a dwarf form on the sandhills. Formby, Marrat. Hightown and Ainsdale.

Pleuropus sericeus *Dixon.*—Aintree, Higgins and Marrat. Damp wall near Bootle.

Camptothecum lutescens *B. & S.*—Crosby, Skelhorne. Hightown, and Southport, Holt. Near Churchtown, and at Formby.

Brachythecium albicans *B. & S.*—Abundant on the sandhills, Marrat, Whitehead, &c. Contrary to its usual habit elsewhere, this species fruits freely with us.

B. salebrosum *B. & S.*—Between Formby and Freshfield.

B. Mildeanum *Schp.* Crosby to Southport, Marrat. Fruits freely. Inland by brick pits on Warbreck Moor.

B. rutabulum *B. & S.*—Very common.

var. **robustum** *B. & S.*—Walton, Ince Blundell, &c.

var. **longisetum** *B. & S.*—Walton Junction, in a bed of *Juncus glaucus* behind the station.

var. **plumulosum** *B. & S.*—Hightown and Formby.

B. velutinum *B. & S.*—Very common.

var. **intricatum.**—Sandhills, near Ainsdale.

B. populeum *B. & S.*—Occurs sparingly on walls and tree roots.

B. plumosum *B. & S.*—Warbreck Moor, and near Sefton.

B. purum *Dixon.*—Frequent. Fruiting at Formby, Marrat.

Eurhynchium piliferum *B. & S.* Ince Blundell and near Ormskirk.

E. crassinervium *B. & S.*—Near Hightown.

E. speciosum *Schimp.*—Ainsdale, Marrat. Also near Sefton.

E. prælongum *B. & S.*—Abundant.

E. Swartzii *Hobk.*—Walton, Aintree, and Barton.
E. pumilum *Schimp.*—Knowsley Park, Harrison.
E. striatum *B. & S.*—I do not recollect seeing this common moss within our area.

E. rusciforme *Milde.*—(Walton Mere, Fisher.) Very fine in a mill sluice at Kirkby; Beesley and Wheldon.

E. confertum *Milde.*—Very common.

E. megapolitanum *Milde.*—Crosby, Harrison and Wilson, 1835. Southport, Marrat. Birkdale, Ainsdale, and formerly opposite Churchtown.

E. murale *Milde.*—Lydiate and Sefton, on damp walls. Rare.

Plagiothecium depressum *Dixon.*—Fazackerly.

P. Borrerianum *Spruce.*—Between Kirkby and Fazackerly.

P. denticulatum *B. & S.*—Frequent.
var. **majus** *Boul.*—Warbreck Moor, Netherton, Rainford, and near Barton.
var. **obtusifolium** *H. & T.*—(Lark Hill, Skelhorne.)

P. sylvaticum *B. & S.*—Warbreck Moor, Marrat. Not seen recently, and may have been the large form of *P. denticulatum* referred to above.

Amblystegium Sprucei *B. & S.*—Southport, 1853, Wood.

A. varium *Lindb.*—On damp bricks in a ditch near Aintree.

A. serpens *B. & S.*—Common throughout the district.
var. **salinum** *Carringt.*—Southport sands, Wood. Formby, Hall Road, and Ainsdale. There is some doubt as to whether this is the *variety depauperatum* of Boulay, therefore Carrington's name, founded on Southport examples, is used.
var. **serotinum** *Lindb.*—Southport, T. Rogers, 1875. I have seen no examples of this, but suspect it to be a form of *A. Juratzkanum*.

A. Juratzkanum *Schimp.*—Sandhills at Birkdale, and on damp stones by the canal near Aintree.

A. **filicinum** *De Not.*—Frequent in damp places both on the sandhills and inland.

var. **elatum** *Schimp.*—Southport, Holt, 1882.

var. **Whiteheadii** *Wheldon.*—Birkdale. On Rainford Moss, 1903, Beesley and Wheldon.

Hypnum riparium *L.*—Frequent in watery places.

var. **longifolium** *Schp.*—Barton, Altcar and Burscough. Fruiting well at Walton Junction and Rainford.

H. elodes *Spruce.*—Southport, Wilson and Marrat. Still occurs at Birkdale, Hightown, and other places on the coast, and inland at Burscough.

H. polygamum *Schimp.*—Southport and Warbreck Moor, Marrat. Still in both localities, and fruits abundantly on the sandhills. On Rainford Moss, Beesley and Wheldon.

var. **stagnatum** *Wils.*—Southport, Wild. Birkdale and Burscough Junction. Rainford Moss, in fine fruit, Beesley and Wheldon.

H. stellatum *Schreb.*—Rainhill, Higgins. Southport Burscough, and Rainford.

H. chrysophyllum *Brid.*—Dry sandy fields north of Southport.

H. aduncum *Hedw.*—Warbreck Moor, Fisher.

F. falcata *Ren.*—Southport, Holt. Still grows at Birkdale and Ainsdale.

F. gracilescens *Ren.*—Southport, Wilson.

F. tenuis *Ren.*—Southport, Holt.

var. **aquaticum** *Sanio.*—Birkdale and Hightown. Also found amongst a gathering of W. Wilson's collected at Southport, 1859.

var. **diversifolia** *Ren.*—Ainsdale and north of Southport.

var. **intermedium** *Schimp.*—Southport, Holt, 1882. Still there, and also occurs at Crossens, Altcar, Burscough, Barton, Walton, and Kirkby.

F. penna *Sanio.*—Warbreck Moor and Barton Moss.

F. laxifolia *Schimp.* — Southport, Holt. Walton Junction and Rainford.

var. **paternum** *Sanio.*—Southport, Holt. Ince Blundell, Walton, Barton and Birkdale. In the latter situation this plant attains a very large size. It has recently been accorded specific rank by Warnstorf.

F. gracilis *Ren.*—Southport, Ainsdale. Walton, and Rainford.

var. **attenuatum** *Boul.*—Burscough Junction.

var. **polycarpon** *Bland.*—Walton and Barton.

Hypnum Sendtneri *Schimp.*—Southport, Wilson. It existed in great variety and abundance from Birkdale to Ainsdale, but much of the ground formerly covered by this and some of the succeeding species has been either built over, or drained to form golf links.

F. vulgaris *Sanio.* — Netherton, Burscough, and Rainford Moss.

H. Wilsoni *Schimp.*—Ainsdale and Southport, with fruit, Wilson. Fruited sparingly in 1900.

var. **hamatum** *Schimp.*—With the last at Birkdale and Ainsdale.

H. lycopodioides *Schaegr.* Southport and Ainsdale, Wilson. Still occurs in diminished quantity, but it is three years since I last saw it with fruit.

H. fluitans *L.*, var. **Jeanbernati** *Ren.*—Rainford Moss.

var. **gracile** *Boul.* — Simmonswood and Barton Mosses.

H. exannulatum *Gümb.*

var. **brachydictyon** *Ren.* — Rainford Moss and Netherton.

var. **falcifolium** *Ren.*— Simmonswood Moss, Marrat. Martin Mere.

H. uncinatum *Hedw.*—(Recorded from Knowsley by Marrat. Not seen recently.

H. revolvens *Sm.*—Southport, Marrat, Ainsdale and Birkdale.

var. **cossoni** *Ren.*—Southport, Wild, Birkdale, Holt.

H. intermedium *Ldb.*—Ainsdale, Wilson. Southport, Holt.

F. falcata *Sanio.*—Southport, Holt.

H. commutatum *Hedw.*—(Opposite the Black Bull Inn at Aintree, Fisher.) This would be the locality known as Seven Pits; all the plants recorded there are now lost.

Hypnum cupressiforme *L.*—Very common.

var. **resupinatum** *Schimp.*—Not infrequent on trees, stones and banks.

var. **ericetorum** *B. & S.*—Barton, Simmonswood and Rainford Mosses.

var. **tectorum** *Brid.*—Common on the sandhills.

var. **elatum** *B. & S.*—Rabbit warrens at Hightown.

H. patientiae *Ldb.*—(Reported from near Thornton, but not seen recently).

H. molluscum *Hedw.*—Hightown, Marrat.

H. palustre *L.*—Very rare. Near St. Helen's, Marrat.

H. scorpioides *L.*—(Sparingly in a swamp near Southport, Marrat.) Growing sparingly amongst *Hypnum revolvens* on Rainford Moss, 1903, Beesley and Wheldon.

H. stramineum *Dicks.*- (Simmonswood Moss, Marrat.) Not seen recently.

H. cordifolium *Hedw.*—Frequent in swamps. Rainhill, Higgins. Formby and Sefton, Skelhorne. Hightown, Barton, Rainford and Netherton, fruiting in the two latter localities.

H. giganteum *Schp.*—Birkdale, Wilson and Marrat. Barton, Altcar, and in several wet places on the sandhills.

H. cuspidatum *L.*—Very common. Fruiting at Walton and Birkdale.

H. Schreberi *Willd.* -Crosby, Harrison and Skelhorne.

Hylocomium splendens *B. & S.* Southport, Marrat. Crosby, Dickinson. No doubt the var. **gracilius** *Boul.*, which still occurs near Formby, Ainsdale, &c.

H. squarrosum *B. & S.*—Frequent amongst grass. by ditches, &c.

H. triquetrum *B. & S.*—Rare. Formby and near Ince Blundell.

H. loreum *B. & S.*—(Walton Mere, and ditches near, H. Fisher.) The locality is an unlikely one, and it is doubtful if this species occurs at all within our limits.

THE HEPATICÆ OF THE DISTRICT.

By J. A. Wheldon, F.L.S.

The first collective account of the Hepaticæ of the district was that read by F. P. Marrat before the Literary and Philosophical Society of Liverpool in 1855. This was followed by a more complete list, which appeared in the proceedings of the same Society in 1860. Very little appears to have been done since, and the following catalogue of those which have been recorded is no doubt far from exhaustive :—

Riccia glauca *L.*—Damp fields at Walton and Linacre.

R. crystallina *L.*—Liverpool Botanic Gardens, and in fields about Gill Moss and Fairfield. Harrison and Marrat.

Ricciella fluitans *L.*—Pond near Knowsley. Higgins and Marrat.

Anthoceros punctatus *L.*—Ditch sides between Barton and Formby.

Marchantia polymorpha *L.*—Very common. A very large erect growing form, fruits freely at Netherton, which is perhaps the var. **aquatica** of authors.

Conocephalus conicus *L.* Frequent in wet places.

Reboulia hemispherica *L.*—In a rocky lane near Lark Hill, West Derby, W. Harrison. Crosby to Southport, Marrat. Fruited freely in a hollow of the sandhills towards Churchtown this summer.

Preissia commutata *Nees.*—Hightown and Birkdale.

Lunularia cruciata *L.*—Frequent in greenhouses at Southport and Liverpool. Not seen away from gardens.

Dilaena hibernica (*Hook*) var. **Wilsoniana** *Gottsche.*—Southport, Carrington. Crosby to Southport, Wilson and Marrat.

Aneura multifida *L.*—Frequent on damp clay soil, by ditches, often amongst mosses. The var. **sinuata,** at Walton, Rainford, and Netherton.

A. latifrons *Ldb.*—With the next at Walton.

A. pinguis *Linn.*—By trickling springs on clay banks near Walton Junction. In the hollows of the sands at Ainsdale and Birkdale.

Blasia pusilla *L.*—(Amongst gorse near Walton Mere, H. Fisher.) Now extinct there.

Pellia epiphylla *L.*—Very common. Fruits abundantly.

P. calycina *Tayl.*—Southport, Ramford, and Walton.

Petalophyllum Ralfsii *Ldbg.* Southport, Carrington, Wild, and W. H. Pearson.

Frullania dilatata *L.*—Tree near Rainhill, and probably elsewhere.

Diplophyllum albicans *L.* Frequent in damp places.

D. obtusifolium *Dum.* Damp sandstone rocks near Kirkby.

Scapania nemorosa *L.* Knowsley Wood, Higgins and Marrat. Sparingly near Netherton, and Rainford.

S. undulata *L.*—Rainford Moss, and in a spring near Kirkby.

S. irrigua *Dum.*—Very fine in the Carr near Netherton.

S. curta *Mart.*—Barton Moss, Dr. Carrington.

Mylia anomala *Carr.*—Moss End Wood, Bold Moss, Higgins and Marrat.

Plagiochila asplenioides *L.* Not common, and only occurs is a small starved form.

Lepidozia reptans *L.*—Knowsley and Bold Woods, Higgins and Marrat.

L. setacea *Web.*—Rainford Moss, Higgins and Marrat. Simmonswood and Barton Mosses, and in the Carr at Netherton.

Gymnocolea inflata *Huds.*—Heaths, quarries, &c. Not uncommon, F. P. Marrat. Rainford and Simmonswood Mosses, with colesules.

var. **laxa** *Carr.*—Plentiful on Simmonswood Moss, Beesley and Wheldon, 1903.

G. affinis *Wils.*—Southport, G. E. Hunt and Dr. Carrington.

Lophocolea bidentata *L.*—Frequent.

L. lateralis *Dumort.*—Near Formby.

L. heterophylla *Schrad.*—Tree roots and on the ground, not infrequent.

Aplozia crenulata *Sm.*—Quarry near Kirkby.

Alicularia scalaris *Schrad.*—Common on moist banks and in quarries, F. P. Marrat. Fruits freely.

Chiloscyphus polyanthos *L.*—Rainford Moss, and at Netherton.

C. pallescens *Nees.*—In the Carr at Netherton.

Kantia trichomanes *L.*—By a ditch near Walton Gaol. On Barton and Rainford Mosses.

K. Sprengellii *Mart.*—On clay banks, Walton, Kirkby, and Rainford.

Kantia arguta *Lindb.*—Sandy railway bank near Ormskirk.

Cephalozia fluitans *Nees.*—Barton Moss, W. H. Pearson. Rainford Moss.

C. bicuspidata *L.*—Quarry near Kirkby, with perianths.

C. Lammersiana *Hüb.*—Kirkby and Simmonswood Moss, 1898.

C. divaricata *Sm.*—Quarry near Kirkby.

C. connivens *Dicks.*—Very fine on Simmonswood Moss.

C. lunulaefolia *Dumort.*—Carr near Netherton.

C. catenulata *Hüb.*—On perpendicular damp sandstone rocks in the Quarry at Kirkby, 1898.

C. sphagni *Dicks.*—Rainford Moss, Marrat. Also on Simmonswood Moss.

ZOOLOGY.

PROTOZOA-FORAMINIFERA.

By G. W. Chaster, M.R.C.S.

THE Foraminifera, whose tests or "shells" are such favourite objects of the microscopist's study, are unusually abundant in the Southport district, no fewer than 170 forms out of the recognised 290 British species having been recorded. This abundance is without doubt due to the large expanse of mud and muddy sand that to so great an extent constitutes the bed of our shallow sea; for these beautiful and delicate organisms find such a habitat peculiarly favourable. All the recorded forms have been obtained from the Southport shore with the exception of eleven procured by dredging at various depths down to 23 fathoms off Southport.

It is not only in point of numbers, however, that our local species are noteworthy; frequent occurrence of many rare forms is remarkable. Thirteen have been noted for the first time in British waters from Southport, and of these seven were quite new to science: the majority of the latter are still unrecorded from any other locality.

It is not my purpose to give a detailed list of all the local species, as the information may be obtained elsewhere, but certain of them may be mentioned as possessing particular interest.

Nubecularia lucifuga *Defr.*—Dredged off Southport and Formby in muddy sand.

Hyperammina elongata *Brady.*—Dredged in 23 fathoms south-west of Southport.

Reophax scottii *Chaster.*—This species, since its description, has been found to be well-nigh cosmopolitan.

Haplophragmium anceps *Brady.*—Very rare, though generally distributed.

Ammodiscus charoides *Jones and Parker, sp.*—Very rare.

A. shoneanus *Siddall.*—Not common in shore mud.

Trochammina inflata *Montagu, sp.*—Very fine specimens are to be obtained from shell drift on the shore.

Textularia fusiformis *Chaster.*—Occurs rarely in muddy deposits.

Spiroplecta biformis *Parker and Jones, sp.*—Very rare on the shore.

Clavulina obscura *Chaster.*—Moderately frequent in shore mud.

Lagena botelliformis *Brady.*—Very rare.

L. aspera *Reuss.*—Very rare. Remarkably fine examples of the clustered form figured by Messrs. Balkwill and Wright have been obtained.

L. striato-punctata *Parker and Jones.*—Very rare.

L. spiralis *Brady (?)*—A specimen found in shore mud was referred to this species, but should probably be taken as the type of a new species as its ribs are not punctate.

L. millettii *Chaster.*— Rare.

L. falcata *Chaster.*—Very rare.

L. marginata var. **inaequilateralis** *Wright.*—Rare.

L. depressa *Chaster.*—Very rare.

L. protea *Chaster.*—Frequent in shore mud.

Lingulina herdmani *Chaster.*—A single specimen of this remarkable species was found in shore mud.

Marginulina costata *Batsch, sp.*—Very rare.

Polymorphina oblonga *d'Orbigny.*—Very rare.

Uvigerina canariensis *d'Orbigny.*—One specimen.

Spirillina margaritifera *Williamson.*—Very rare.

Discorbina tuberculata *Balkwill and Wright.* Rare.

D. minutissima *Chaster.*—Not common in shore mud.

Truncatulina reticulata *Chaster.*—A single specimen.

Pulvinulina nitidula *Chaster.*—Very rare.

Nonionina pauperata *Balkwill and Wright.*—Rare.

REFERENCES.—W. C. WILLIAMSON, on the recent Foraminifera of Great Britain. D. H. MCNICOLL, *Handbook for Southport*, 1859. G. W CHASTER, *Report upon the Foraminifera of the Southport Society of Natural Science District. First Report of the Southport Society of Natural Science*, Appendix 1892.

LEPIDOPTERA.

By F. N. Pierce, F.E.S., and J. R. Charnley, F.Z.S., F.E.S.

It will be admitted by all who are interested in that department of study which deals with the fascinating history of insect life, that the Southport district affords a bountiful field for the patient lepidopterist. Few areas in the north present physiographical conditions so favourable to the divers branches of entomological life. Although great stretches of land, with adjacent marshes running far inland, have during the past century been largely reclaimed, their sites yield, in their many local phases of growth and life, abundant facilities for investigation. It may not be foreign to this brief introduction to the lepidoptera, to refer to the action of landowners in rescuing from the sea thousands of acres of lands which a hundred years ago were washed by the tidal flow, but are now transformed into rich productive agricultural farms. In that western expanse which, having the sea board as its boundary, extends from Preston to Bootle and runs eastward to the high ground formed in part by the line of the Wyresdale and Parbold hills, there are, fringing the sea, sand dunes, which run from Southport southwards towards the port of Liverpool. Inland, there are the arable and grass farms and long level fields of deep moss which run at varying depths through the very heart of the district. This area of country is intersected by drainage dykes and watercourses, and is penetrated by the rivers Douglas and Alt. Midway between Preston and Southport are the luxuriant woodlands of Rufford and Croston, with a generous growth of timber and almost endless variety of hardy shrubs; splendid orchards, and productive fruit gardens are well distrited in the same district. Further inland, sweeping round by Parbold, are the shoulders of those hills of millstone grit which form part of the eastern boundary of the plain of western Lancashire, and in proximity to these is the ridge of high ground formed of the coal

measures, for the most part covered with deep beds of clay.

It is not surprising, therefore, that a district containing rocks (using the word in a geological sense) of so many different formations should possess a wondrous variety of vegetation, which obviously has a considerable influence on the local distribution of its lepidoptera. The sandhills have for long been a favourite locality, and their lepidopterous fauna are intimately known. The "mosses" too have been exhaustively worked, and have yielded a great tribute to the discerning examination of the experienced collector. The wooded portions of the district, however, have hardly been investigated at all: and as to the eastern portion, there appears to be scarcely a record.

Of the Rhopalocera, about 30 species have occurred within the limits of the district. Of these we may note *Cœnonympha typhon*, *Rott.*, var. *Rothlicbi*, *Stgr.*, which is common on the mosses at Simmonswood, Kirkby, &c., being a dark coloured form with large well-defined ocellated spots on the underside.

Of the Heterocera, we have a more general selection. Nearly half the Sphinges are recorded, including *Deilephila galii*, *Schiff.*, which is common on the sandhills in certain years, particularly in the larval state. About 50 Bombyces occur, among which is the rare *Cerura bicuspis*, *Bork.*, a species first taken in England by James Cooper on an alder at Preston (now its chief resort in the north of England) in 1847. The Noctuæ are fairly well represented, being largely collected on the sandhills by a process locally called "raking." This consists of shaking the overhanging star grass with a stick or similar implement, when beautiful specimens of *Mamestra albicolon*, *Hb.*, *Agrotis vestigialis*, *Hufn.*, *A. tritici*, *L.*, *A. præcox L.*, *Noctua umbrosa*, *Hb.*, *N. xanthographa*, *Fb.*, and many other species may readily be taken. Sugaring, and lamp searching, are also productive methods in certain seasons, when occasional rarities such as *Caradrina exigua*, *Hb.*, have been captured. Another successful mode is searching the flowers of the Ragwort (to which the coast

species come plentifully) with a lantern. *Triphæna interjecta*, *Hb.*, and others may thus be taken.

In the Geometræ (which are well represented) we have the beautiful little *Nyssia zonaria*, *Schiff.*, which made its appearance along the coast sandhills almost simultaneously with its occurrence at New Brighton. We are sorry to report, however, that it appears to be getting scarcer. *Carsia paludata*, *Thnb.*, also a local speciality, is common on the moorlands and "mosses."

The lepidoptera have had many followers in Lancashire, who have done excellent work towards their classification, &c., and of whom we need only mention C. S. Gregson, of Liverpool; J. B. Hodgkinson, of Preston; and Joseph Chappell, of Manchester; while among those still happily surviving are S. J. Capper (President of the Lancashire and Cheshire Entomological Society) of Liverpool, and J. Cosmo-Melville, B. H. Crabtree, and Herbert Massey, of Manchester.

There are several good collections in the district, notably that of Mr. S. J. Capper, which is extremely rich in varieties. Others of note are the Cooke collection in the Liverpool Museum and Mr. Robertson's old collection. The latter contains many examples of now reputed British species, which there is no reason to doubt were taken, possibly plentifully, in his day.

Several local lists have, from time to time, been published, the chief of which is the "Lepidoptera of Lancashire and Cheshire," compiled by the members of the Lancashire and Cheshire Entomological Society, and edited by Dr. J. W. Ellis, to which catalogue we are indebted for assistance in the following pages. Isaac Byerley's list in the "Fauna of Liverpool" (1854), and C. S. Gregson's "Lepidopterous Insects of the district round Liverpool" (1855), may also be mentioned.

Of the Societies in the district, the only one devoted exclusively to Entomology is the "Lancashire and Cheshire Entomological Society," whose headquarters are situate at the Royal Institution, Colquitt-street, Liverpool, but whose meetings are held at various towns in the two counties.

The classification (still a "burning question") adopted is that of South's Synomymic List, 1884.

In conclusion, we would remind lepidopterists resident in the district, that there is still an important field open for further research, and we have no doubt that it will furnish satisfying results to those collectors who are endeavouring to add to the stores of knowledge which have been placed at our disposal by those who have sought to classify and examine the various forms of insect life, which are among the most beautiful and complex of nature's offerings.

RHOPALOCERA.

Pieris brassicæ *L.*

P. rapæ *L.*

P. napi *L.*—All three abundant throughout the district.

Euchloe cardamines *L.*—occurs in damp sunny districts.

Colias hyale *L.*—Occasionally on the coast sandhills.

C. edusa *Fb.*—Has been taken in "Edusa years," generally along the coast sandhills. A single specimen of the female variety **helice** (*Hb.*) is recorded for Crosby on the authority of Thomas West.

Gonopteryx rhamni *L.*—A male captured at Farington, near Preston, 1896, W. H. Heathcote; and one at Croston, 1900, by ourselves.

Argynnis aglaia *L.* Formby and Southport.

Melitæa aurinia *Rott.* **artemis**, *Fb.* - Lydiate, C. S. Gregson. - Now extinct.

Vanessa polychloros *L.*—Liverpool, N. Cooke.

V. urticæ *L.*—Abundant and generally distributed.

V. io *L.*—Occurs throughout the district, but not so abundantly as formerly.

V. antiopa *L.*—Dr. Ellis in the Lancashire and Cheshire Lepidoptera gives a list of localities where this rare immigrant has been observed, of which Knotty Ash and Liverpool may be mentioned.

V. **atalanta** *L.*—Is generally distributed and common in certain years.

V. cardui *L.*—Very irregular in its appearance. In some years the larvæ are to be met with in the utmost profusion along the coast on thistles.

Pararge egeria *L.*—A single specimen taken by ourselves in the heart of Liverpool.

P. megæra *L.*—Common in lanes, outskirts of woods, &c.

Satyrus semele *L.*—Abundant on all the coast sandhills. By careful collecting curious aberrations in the number of the spots may be obtained.

Epinephele janira *L.*—Common and generally distributed.

E. tithonus *L.*—Tolerably plentiful about flowery banks and hedgerows, especially near the coast.

E. hyperanthes *L.*—Birkdale, Moss Bridge, E. B. Hobson.

Cœnonympha pamphilus *L.*—Generally distributed.

Thecla betulæ *L.*—Coleman in his "British Butterflies" mentions Preston as a locality but gives no authority.

T. rubi *L.*—Lydiate, C. S. Gregson. Probably occurs wherever its food plant *Cytisus scoparius* is commonly grown.

Polyommatus phlœas *L.*—Abundant.

Lycæna icarus *Rott.*—Abundant on the sandhills, as is also the var. **icarinus** *Scriba.*

L. minima *Fues.*, **alsus** *Fb.*—Birkdale, E. B. Hobson.

Thanaos tages *L.*—Parbold, E. B. Hobson.

Hesperia sylvanus *Esp.* Crosby sandhills, C. S. Gregson. Apparently extinct.

Heterocera.

Acherontia atropos *L.* Occurs frequently throughout the district. The larvæ are probably largely overlooked in potato fields.

Sphinx convolvuli *L.* Very rarely near Southport and Liverpool. There is no record of the usually commoner species, **S. ligustri** *L.*

Deilephila livornica *Esp.*—A single example taken at Preston by James Cooper in 1846.

Chœrocampa celerio *L.*—Two specimens are recorded from Southport: one by Mr. E. Bell in 1871, and one by Mr. H. Burton in 1873. Also a very fine specimen taken at Crosby by Mr. G. A. Harker in 1885.

C. porcellus *L.*—Of frequent occurrence, especially along the coast sandhills.

C. elpenor *L.*—Found in similar situations as last species but in less abundance.

Smerinthus ocellatus *L.* and **S. populi** *L.*—Are common in the suburbs of Southport, Preston, &c.

Macroglossa stellatarum *L.* Fairly common and in some seasons abundant.

Trochilium crabroniformis *Lewin.*, **bembeciformis** *Hb.*—Common among willows and poplars.

Sesia tipuliformis *Clerck.*—Common in fruit gardens.

S. culiciformis *L.*—Parbold, E. B. Hobson.

Zygæna filipendulæ *L.*—Abundant all along the coast and inland at Preston, &c.

Nudaria mundana *L.*—Preston, J. B. Hodgkinson.

Lithosia mesomella *L.*—Simmonswood and other mosses.

L. lurideola *Zinck.*, **complanula** *Bdv.*—Generally distributed.

L. sericea *Greg.*—Somewhat restricted. Simmonswood Moss, C. S. Gregson; propably other mosses.

Gnophria quadra *L.*—Birkdale, E. B. Hobson. Maghull, W. A. Tyerman. The range of this southern species appears to be extending northwards of late years.

Euchelia jacobææ *L.*—Very abundant along the coast sandhills, where the larvae may be taken in great profusion, feeding gregariously on the Ragwort (*Senecio jacobæa L.*)

Nemeophila russula *L.*—On the peat mosses.

N. plantaginis *L.*—On the mosses; Rufford and Farington.

Arctia caja *L.*—Abundant everywhere.

Spilosoma fuliginosa *L.*—Common on the heaths, mosses, and especially on the sandhills. A dark form occurs in which the hind wings are suffused with dusky scales.

S. mendica *Clerck.*—Preston, J. B. Hodgkinson.

S. lubricipeda *Esp.*, and **S. menthastri** *Esp.*—Are abundant throughout the district.

Hepialus humuli *L.*—Common everywhere.

H. sylvanus *L.*—Fairly plentiful at Ainsdale, Moss Bridge, &c.

H. velleda *Hb.*—Generally distributed on the mosses.

H. lupulinus *L.*—Abundant and generally distributed.

H. hectus *L.*—Locally common at Preston and Liverpool.

Cossus ligniperda *Fb.*—Generally distributed throughout the wooded portions of the district, and has been taken freely by ourselves on the Southport sandhills, the larvæ making up in the sand.

Porthesia auriflua *Esp.*—Common.

Leucoma salicis *L.*—Extremely abundant along the coast.

Dasychira fascelina *L.*—Occurs frequently along the coast and sparingly on the mosses.

D. pudibunda *L.*—Rarely at Preston, J. B. Hodgkinson.

Orgyia antiqua *L.*—Abundant.

Pœcilocampa populi *L.*—Occurs sparingly about Preston and Liverpool.

Eriogaster lanestris *L.*—Preston.

Bombyx rubi *L.*—Abundant on the sandhills and mosses.

B. quercus *L.* var. **callunæ** *(Palmer).*—Common on the sandhills and mosses.

B. trifolii *Esp.*—This species, though still common on the sandhills, is gradually being exterminated by building operations.

Odonestis potatoria *L.*—Abundant on the sandhills and in grassy lanes.

Saturnia pavonia *L.* **carpini** *Schiff.*—Common on the mosses, where numbers of males may be taken by the process of "assembling."

Cilix glaucata *Scop.* **spinula** *Schiff.*—Common.

Platypteryx lacertinaria *L.*, and **P. falcataria** *L.* —are common among birch on the mosslands.

Cerura furcula *L.*—Mosses round Preston district.

C. bifida *Hb.*—Crosby and Preston.

C. vinula *L.*—Common, and generally distributed throughout the district.

Lophopteryx camelina *L.*—Fairly common on the mosses, where the larvae feed on the stunted birches.

Notodonta dictæa *L.*—Generally distributed.

N. dictæoides *Esp.*—Local on the mosses.

N. dromedarius *L.*—Preston. Not rare.

N. ziczac *L.*—Crosby and Preston. Common.

Phalera bucephala *L.*—Abundant throughout the district.

Thyatira derasa *L.*—Generally distributed and common in certain localities, e.g. Preston.

T. batis *L.*—Fairly common and generally distributed.

Cymatophora or *Fb.*—Occurs occasionally about Preston, J. B. Hodgkinson.

C. duplaris *L.*—Preston. Not common. J. B. Hodgkinson.

Asphalia flavicornis *L.*—Abundant, and generally distributed over the mosslands.

In the NOCTUÆ (of which about 160 species are present) we note the following :—

Acronycta leporina *L.*—Generally distributed. Preston, Liverpool, Simmonswood Moss, &c.

A. alni *L.*—Two larvæ of this species, which is seldom seen in the perfect state, were taken by Mr. S. J. Capper at Huyton in August, 1871.

A. menyanthidis *Viet.*—Common on the moss and moorland districts.

Leucania littoralis *Curt.* Confined to the coast sandhills, where the larva is usually abundant.

Hydræcia nictitans *Bork.*—Common, and generally distributed.

H. petasitis *Dbl.*—This species, though much less common than formerly, still occurs on the moorlands about Preston.

Xylophasia monoglypha *Hufn.* **polyodon** *L.*—Common. The dark form is frequently taken on the mosses.

Celæna haworthii *Curt.*—Common on the mosses.

Cloantha solidaginis *Hub.*—Local. Near Preston and one specimen from Liverpool.

Agrotis cursoria *Bork.*—Common on the coast sand-hills.

A. agathina *Dup.*—Simmonswood and Farington Mosses.

A. strigula *Thnb.* **porphyrea** *Hb.*—Fairly common on heather.

Noctua conflua *Tr.*—Preston, J. B. Hodgkinson.

Tæniocampa opima *Hb.*—Common at Wallasey.

Xanthia aurago *Fb.*—Two examples taken at Lydiate, C. S. Gregson.

Polia chi *L.*—Common, and generally distributed.

Epunda lichenea *Hb.*—Formby and Crosby.

Cucullia chamomillæ *Schiff.*—Larva usually common on the wild chamomile (*Anthemis nobilis*).

Heliothis peltigera *Schiff.*—Farington Moss, J. B. Hodgkinson. Very rare.

Chariclea umbra *Hufn.* **marginata** *Fb.*—Common at Crosby, which is the only Lancashire locality recorded for it.

About 120 of the Geometræ occur, including all the "Thorns" with the exception of **Selenia bilunaria** *Esp.*, and **Eugonia autumnaria** *Werneb.* **Boarmia repandata** *L.* is common and frequently "melanic." The local **Tephrosia biundularia** *Bork.*, has been taken sparingly at Preston. The majority of the Acidalias are reported, of which the rare **circellata** *Gn.* formerly occurred on the mosses, but is now probably extinct. **Sterrha**

sacraria *L.* has put in an occasional appearance at Liverpool; and a good deal of attention has been paid to the Eupithecias and a large number recorded.

The space at our disposal will not admit of a more extended list; the foregoing remarks, however, will, it is hoped, serve to give a general idea of the Macro-lepidoptera of the district.

COLEOPTERA.

By G. W. Chaster, M.R.C.S. and E. J. Burgess Sopp, F.E.S.

Although the district, as defined for the purposes of this handbook, comprises an area of about 220 square miles, our list is, unfortunately, deprived of much of its completeness from the fact that very little of the ground has ever been worked by coleopterists.

The area, as described elsewhere, is roughly divisible into two well-marked portions—a low lying, level area of boulder clay overlain by peat or forest beds and blown sand, and an inland tract of broken and undulating country whose slopes of low sandstone hills alternating with brakes and woodlands present a diversity of collecting ground not to be met with in the immediate neighbourhood of Southport.

There are, however, few records of this latter part having been visited, much less systematically explored, a remark applying indeed in lesser degree to much of the plain, so that we have perforce to confine our notes in the main to a small tract of land embraced within a few miles radius of our town, with stray references to one or two other localities lying within easy reach of either Liverpool or Southport. Even this restricted zone has never been exhaustively worked, and although among earlier collectors associated with it, the names of Archer, Constantine, Cooke, Davies, Haward, Gregson, Kinder, Sidebotham and others occur to us, and while such latter-day enthusiasts as Drs. Bailey, Billups, Ellis, and

Norman Joy, and Messrs. Dutton, Sharp, Kidson Taylor, Tomlin, and Wilding have paid frequent visits to the district, these entomologists would probably be the first to admit that their observations and collecting had alike for the most part been of an entirely spasmodic and unmethodical character. Within the past few years, however, some slight attempt has been made to systematically investigate the ground in the immediate vicinity, although up to the present no winter collecting has been found practicable, nor have either the waters or the woods been laid under serious tribute for our catalogue.

In common with that of many other centres the abundance of our local fauna is becoming slowly but surely curtailed by the gradual development of the district as a residential resort of no mean importance. Most of the haunts dear to the hearts of former collectors are gone and forgotten, save where their appellations remain to us as a memory in the names of the streets which have succeeded them; and, yearly, many still cherished spots become obliterated by the ever onward march of those products of our civilization, the progressive Council and the speculative builder. Even more disastrous than drainage and other schemes of improvement (from the commercial point of view), has been, perhaps, the invasion of our sandhill fastnesses by the ubiquitous golfer and his satellites, portions of whose lengthy courses lie over, or are contiguous to, some of our most productive collecting grounds. But, despite these and other drawbacks, we feel little apology is needed for the lists we append.

With its genial and somewhat humid climate, extended springs and lingering autumns, little exposed to sudden vicissitudes of temperature, and largely possessed of a warm, well drained sandy soil, the neighbourhood would be expected to prove rich in coleopterous treasure, and such we have found to be the case, our catalogue already including about 850 of the 3,300 indigenous species of the order, or within some 150 of the total recorded by Dr. Ellis for the much more extensively worked Liverpool district to the south. But what cannot fail to strike the

collector new to the locality, even more than the mere abundance of beetles, is the high percentage of decidedly uncommon species with which he everywhere meets, and of which many are at times found in profusion. We have, in fact, no hesitation in claiming that the Southport district will compare very favourably, for the number of its rarities, with many localities at present enjoying a greater classical distinction amongst entomologists.

Of local captures to which special attention may be drawn are the following:—*Thinobius brevipennis*, *Kies*, from flood refuse in May, an insect hitherto only recorded from the fen districts of Huntingdonshire and Cambridgeshire, and the Isle of Wight. *Anisotoma picea*, *Ill.* of which rare species, taken some years ago in Scotland by Mr. Foxcroft (Col. Brit. Is., Vol. III., p. 28), a single specimen occurred on April 19th, 1901. *A. rugosa*, *Steph.*, also extremely rare, was taken by evening sweeping during the succeeding autumn. *A. ciliaris*, *Schmidt*, always a scarce clavicorn, occurs somewhat sparingly on the Birkdale and Southport sandhills, whilst the very rare *A. fuva*, *Er.*, recorded by Canon Fowler from Lancashire and Devonshire only, was not uncommon on the same dunes during the autumn of last year. *Rhizophagus cæruleipennis*, *Sahlb.*, described as "one of the rarest of our British beetles" (Col. Brit. Is., Vol. III., p. 267), has only been recorded from Matlock, and Crosby in our district, where Mr. J. Kidson Taylor obtained a single specimen from a log on the sandhills some years ago. *Heterocerus fusculus*, *Kies*, an insect which, until recently, had only occurred as British at Luccombe Chine, in the Isle of Wight, where it is extremely local, was taken on the Birkdale sandhills in June, 1901, and during the spring of the present year. *Aphodius scrofa*, *Fab.*, a species which, although possessing a wide distribution in Austria, France, and Germany, with a northern extension into Sweden, has only twice been taken in Britain; once by the late Mr. Joseph Sidebotham at Southport, in July, 1866 (Ent. Mo. Mag., Vol. V., p. 100), and again at Pentire Point, Cornwall (Stephens). *Heptaulacus villosus*, *Gyll.*, first occurring in

our district to the late Mr. Benjamin Cooke, who captured a single specimen in June, 1858 (Ent. Mo. Mag., Vol. V., p. 44), is still met with rarely in the neighbourhood; one has also been recorded within recent years from Wallasey and two from Hoylake on the opposite Cheshire coast. Our greatest speciality, however, is, undoubtedly, *Ammœcius brevis, Er.*, a lamellicorn first recorded as British from Southport by the late Mr. Haward in May, 1859. The species has so far been captured in no other British locality. It was our experience until quite recently that, in addition to being extremely local in its distribution, this insect was also distinctly scarce in the neighbourhood, but on one day during the past spring it suddenly appeared in considerable numbers, a circumstance of no little interest, as serving to confirm the only other recorded instance of a similar phenomenon, which occurred to Mr. Haward shortly after his discovery of the species (Col. Brit. Is., Vol. IV., p. 36), more than forty years ago. We regret that our efforts to solve the problem of its life-history have up to the present been unsuccessful, and its habits and the nature of its food are still as much a mystery to us as are the causes of its periodic variance in abundance. These remarks apply with equal force to the nearly allied *Ægialia rufa, Fab.*, whose occasional profusion and subsequent disappearance during a sequence of years at Wallasey has proved so perplexing an enigma to entomologists ever since its first discovery by the late Mr. Frederick Archer in 1862. (Liverpool Naturalists' Scrapbook, p. 186). Although never previously recorded from the neighbourhood this insect suddenly appeared in profusion about a very restricted area on the Birkdale sandhills in June, 1902. During the spring of the present year it occurred again in the same place, though in smaller numbers. The species is apparently scarce on the continent, and at the time Mr. Archer captured his first specimen Erichson knew of but a few German examples, whilst Thompson recorded it rarely from one locality in southern Sweden only. *Anthicus bimaculatus, Ill.*, taken at Southport by the late Mr. Joseph Chappell, in June, 1859, and again

by Mr. Broadhurst in the summer of 1867 (Ent. Mo. Mag., Vol. IV., p. 232) has since been recorded by Dr. Ellis and Messrs. Kinder and Wilding from Crosby (Col. L'pool Dist., p. 67), by Mr. W. E. Sharp from Formby, by Dr. N. Joy and Mr. J. F. Dutton and ourselves from Birkdale and Southport. This interesting species has always been considered a great rarity, on account of its restricted range of distribution and the scanty numbers in which it has hitherto occurred, rarely more than a single example having been taken at any one time. But early in the present summer it was met with in abundance, a single hour's collecting resulting in the capture of fifty specimens. The very rare weevil *Gymnetron collinus, Gyll.* formerly recorded from Charlton Pits, Kent, by the late Mr. S. Stevens, occurred occasionally, though locally, on the common toad-flax *(Linaria vulgaris, Mill)* near Southport, during the summer of 1902, in company with its near kin *G. linariæ, Panz*, which is not uncommon in the district. The names of several other insects suggest themselves as worthy of some notice, but, with the limited space at our disposal and abundant material at hand, it behoves us to at once pass to a more general enumeration of species whose selection shall be more typically representative of the coleopterous fauna of our immediate neighbourhood as a whole. In presenting such, it may be desirable, considering the great interest at all times attaching to the distribution of species in Britain, to so arrange our list as to show that our district would seem to be the southern limit of certain northern forms, and the northern limit of others which have hitherto only been recorded from the south, or south-midland counties of England; whilst "gaps" have not infrequently been filled between records from Scotland and from the South. We therefore append a short list of some of our more noteworthy beetles, classified under the following headings:—(1) Northern forms, (2) Southern forms, (3) Northern and Southern types having scanty or no intermediate records, and (4) General list of typical rarities.

I.—Northern Forms.

Homalota cavifrons *Sharp.*—From Parbold, an insect apparently only recorded from the hilly districts of Edinburgh and Thornhill.

Anisotoma picea *Ill.*—A single specimen from Southport, April, 1901. Hitherto only recorded very rarely from the Forth, Clyde, and Tay districts of Scotland.

Parnus nitidulus *Heer.*—This very rare insect has been taken by Mr. J. F. Dutton and ourselves on the sandhills.

Telephorus darwinianus *Sharp.*—Under clods of earth and debris on and near the shore. The species is local in the Forth and Solway districts of Scotland, and north-east of Ireland.

II.—Southern Forms.

Harpalus anxius *Duft.*—This insect, stated by Canon Fowler to be "not apparently found in the north" (Col. Brit. Is. Vol. I. p. 53), is a common insect along the coast littoral on both sides of Liverpool Bay.

Bembidium quadrimaculatum *Gyll.*—Southport. Rare.

Noterus sparsus *Marsh.*—Another southern insect whose occurrence is not uncommon over a wide tract of country in our neighbourhood, since, in addition to its capture in the Southport district, it has been recorded commonly from Liscard, New Ferry, etc., by Dr. Ellis, and abundantly from ditches in the Ince Marshes, Cheshire, by Mr. W. E. Sharp.

Oxypoda waterhousei *Rye.*—A scarce beetle in the London district, is taken at Birkdale.

Bolitochara bella *Maerk.*—Birkdale, in fungus.

Thinobius brevipennis *Kr.*—Birkdale sandhills.

Euplectus piceus *Mots.*—Southport district. Occasionally under bark.

Scymnus frontalis *Fab.*—Birkdale sandhills.

Monotoma quadricollis *Aube.*—Southport, in garden refuse. Scarce.

Antherophagus silaceus *Herbst.*—A single example of this scarce Clavicorn was captured at Southport in July, 1899.

Syncalypta hirsuta *Sharp.*—Occasional. On the Southport sandhills.

Heterocerus fusculus *Kies*—Birkdale sandhills in June, 1901, and April, 1903.

Throscus carinifrons *Bonv.*—Hitherto unrecorded north of the London district, has been taken by beating hawthorn at Churchtown.

Crepidodera chloris *Foudr.*—One, near Southport.

Chætocnema hortensis *Fourc.*—Southport.

Gronops lunatus *L.*—At the roots of *Equisetum* and *Polygonum*, Southport foreshore. Rare.

Tychius squamulatus *Gyll.*—Birkdale sandhills. June, 1902.

Gymnetron collinus *Gyll.* This rare weevil occurs sparingly on *Linaria vulgaris*, near Southport.

Balaninus pyrrhoceras *Marsh.*—Not recorded from any district north of the Midlands. It occurs rarely in the neighbourhood of Southport. Mr. J. F. Dutton has also recently captured it in Delamere Forest.

III.—Intermediate Forms.

Stenolophus vespertinus *Panz.*—At roots of grass, amongst rushes, &c., in marshy situations; generally distributed but scarcely common in the district. The species has also been recorded by Dr. Ellis and Mr. W. E. Sharp from the Ince Marshes in Cheshire.

Bembidium clarki *Daws.*—Very rare. Amongst moss on the Birkdale sandhills.

Oxypoda exigua *Er.*—Recorded as rare in Kent and the neighbourhood of London, and from the Tay district of Scotland (Col. Brit. Is., vol. II., p. 32) occurs somewhat uncommonly at Birkdale.

O. hæmorrhoa *Mann.*—Birkdale. Rare, in moss.

Homalota subsinuata *Er.*—Common.

Diglossa mersa *Hal.*—Hightown and Formby shores. Not uncommon.

Trogophlœus tenellus *Er.*—Occasionally, Birkdale sandhills. Taken in abundance in the Birkdale Cemetery at the end of last September by Mr. J. R. le B. Tomlin.

Homalium deplanatum *Gyll.*—Six, from cut starr grass on the Birkdale sandhills in July, 1902.

Scydmænus exilis *Er.*—Very rare in the district. It occurred to Dr. Ellis under fir-bark at Eastham, near Liverpool, in June, 1883 (Col. L'pool Dist., p. 207).

Eumicrus tarsatus *Müll.*—Usually rare north of the Midlands. Is very common in garden refuse in the Southport district.

Euplectus karsteni *Reich.*—This species and the following are moderately common in garden refuse.

E. signatus *Reich.*

Cerylon ferrugineum *Steph.*—Parbold.

Orthochætes setiger *Beck.*—Birkdale sandhills. Not common. The distribution of this species is essentially a southern one, although it is recorded from Scotland on Murray's authority. (Vide Col. Brit. Is., Vol. V., p. 265).

Erirrhinus scirpi *Fab.*—A single specimen swept from sallow near Southport, July, 1902.

Miccotrogus picirostris *Fab.*—As a rule rare in the north, is not uncommon in the neighbourhood of Southport.

Gymnetron linariæ *Sanz.*—Local, but not uncommon on *Linaria vulgaris* near Southport. The species was recorded by Stevens from Charlton Pits, Kent, and by Stephens from Norfolk; it has also occurred very rarely in the Forth district of Scotland. Dr. Sharp is of opinion that the entry "Dalmeny Park, Dr. Greville," in Murray's catalogue, may have applied to **Miarus campanulæ** *Linn.*

Ceuthorrhynchus punctiger *Gyll.*—Southport foreshore in summer.

C. euphorbiæ *Bris.*—Southport, July, 1902. Both this and the preceding species appear to be alike rare in the south of England and Scotland.

Ceuthorrhynchidius dawsoni *Bris.*—This species, which is recorded by Canon Fowler from Kent, Sussex,

Hampshire, the Isle of Wight, Devonshire, and the Forth district of Scotland (rare), has occurred on the Southport foreshore.

IV.—General Rarities, etc.

Cicindela hybrida *Linn.*—Common in spring and Autumn on the coast sandhills at Ainsdale, Freshfield, etc. The species varies considerably locally, and specimens are sometimes captured with markings presenting a form intermediate between **C. maritima** *Dej.* and the type. It is probable that some of these hybrid forms are responsible for the records of the first-named species from Birkenhead, Wallasey (Col. Brit. Is., Vol. I., p. 4), and Fleetwood (Rossall Dist. Fauna, p. 21), since we know of no capture of **C. maritima** nearer than the shores of Cardigan Bay, where it has occurred commonly to Mr. Sharp.

Carabus nitens *Linn.*—The smallest and most beautiful of our British **Carabi** was formerly abundant in the neighbourhood, and still occurs locally about Freshfield and probably other parts of the district in May.

Dyschirius nitidus *Dej.* This very local maritime species has been taken by Dr. Ellis at Hightown and Crosby, and by Mr. J. R. le B. Tomlin at Blundell-sands.

Harpalus neglectus *Dej.*—Another local and maritime beetle, occurs sparingly on the Birkdale and Hightown sandhills.

Amara rufocincta *Dej.*—A scarce insect in the north, has been recorded from Lydiate by Dr. Ellis, and from Crosby by Mr. Wilding.

Bembidium lunatum *Duft.* One of the handsomest of our indigenous **Bembidii** is abundant at the mouth of the River Alt, and occurs also at Preston and Crossens.

Hydroporus umbrosus *Gyll.*—Birkdale.

Gyrinus bicolor *Payk.* A single specimen of this very rare species was taken at Crossens in April, 1899. A former example was recorded many years ago by the late Mr. F. Archer from a ditch on the Altcar Rifle Ranges (L'pool Naturalists' Scrapbook, p. 168).

Hydrous caraboides *Linn.*—An example of this interesting beetle was captured in Birkdale, having flown on to a greenhouse at night.

Limnebius nitidus *Marsh.*—Not uncommon in the district.

Hydræna nigrita *Germ.*—Three, amongst dead leaves in the fairy glen, Appley Bridge, April, 1900.

Microglossa suturalis *Mann.*—Occasional in haystack refuse, Birkdale.

Oxypoda exoleta *Er.*—Unrecorded from the north-west. Occurs not uncommonly at Birkdale.

Ischnoglossa prolixa *Grav.*—Always very rare in the north. Has been taken under bark in Hesketh Wood, Southport.

Phlœopora corticalis *Grav.* Under bark of dead pines in Hesketh Wood, Southport.

Callicerus rigidicornis *Er.*—A single specimen, Birkdale sandhills.

Homalota occulta *Er.*—Rare. Birkdale.

H. angustula *Gyll.*—Southport, in moss.

H. exilis *Er.*—This very local beetle, of which no records occur between Worcester in the Midlands and Scarborough in the north-east, is taken commonly in moss and flood refuse on the Birkdale sandhills.

H. coriaria *Kr.*—Birkdale. One specimen from moss in 1899.

H. pilosiventris *Thoms.*—A single example from Birkdale in 1899. There appear to be no records for this species between Sherwood Forest (Blatch) and the Northumberland district.

H. orbata *Er.*—Birkdale.

Phytosus nigriventris *Chevr.*—Frequent on the shore in spring and autumn in empty egg-capsules of *Buccinum undatum*, the common whelk.

Myllæna gracilis *Matth.* The only previous northern record is Cheshire (Col. Brit. Is., Vol. II., p. 180). It occurs in moss at Birkdale.

Hypocyptus ovulum *Heer.* A single specimen of this rare little "staph" was captured under a log at Ainsdale.

Mycetoporus nanus *Er.*—Birkdale, in garden refuse. Crosby (one) in April, 1882, by Dr. Ellis.

M. angularis *Rey.*—Two. Birkdale sandhills in May, 1902.

M. clavicornis *Steph.*—Birkdale sandhills in June, 1898.

Habrocerus capillaricornis *Grav.*—Previously unrecorded from the north-west, has occurred amongst leaves and powdery fungi in a wood behind Scarisbrick Hall.

Quedius puncticollis *Thoms.*—Birkdale sandhills in December, 1899. The species has been found in a wasp's nest at Ince (Cheshire) by Mr. Robert Newstead.

Q. cruentus *Ol.*—Common in heaps of cut grass, straw, etc., at Birkdale, especially in 1902. Also recorded from Formby.

Q. cruentus, var. **virens** *Ratz.*—With the type at Birkdale. Rather common.

Q. obliteratus *Er.* (**suturalis** *Fowler*)—Common in cut starr grass, Birkdale sandhills, 1902.

Q. scintillans *Grav.* Birkdale and Southport. Rare.

Philonthus proximus *Kr.*—Has occurred to Mr. Tomlin on the Hightown shore, to Mr. Sharp at Ormskirk, and to ourselves at Birkdale, where it is, however, rare.

P. carbonarius *Gyll.*—Birkdale.

P. umbratilus *Grav.*—Southport district.

P. fumigatus *Er.*—A scarce insect in many localities, has been recorded from Hightown by Dr. Ellis and Mr. Wilding: from Formby by Mr. Sharp. Birkdale sandhills.

P. ventralis *Grav.*—Formby in 1894, Mr. Tomlin. Southport district.

P. micans *Grav.*—Formby in 1886, Dr. Ellis. Birkdale, common in wet moss on the sandhills.

P. nigritulus *Grav.*—Common.

Actobius signaticornis *Rey.*—Hightown, Birkdale sandhills. Common in wet moss.

A. procerulus *Grav.*—Not uncommon during July on marshy ground, Southport foreshore.

Leptacinus parampunctatus *Gyll.*—Occurs in the same locality as the last, in August.

L. batychrus *Gyll.*—With the preceding species, but scarcer.

Lathrobium longulum *Grav.*—Birkdale sandhills in July and August. Not common. The specimens are generally of a rather bright red hue, only one example can be considered pitchy or reddish brown.

L. quadratum *Payk.* -Dr. Ellis records a single specimen from Hightown (Col. L'pool. Dist., p. 217) and another has recently occurred to us at roots of reeds, Crossens.

Cryptobium glaberrimum *Herbst.*—Birkdale sandhills. Rare.

Medon obsoletus *Nord.*—This usually somewhat rare species, which occurs occasionally in the district, was abundant, locally, from 1900 to 1902 in a situation on the Birkdale sandhills, now (alas!) destroyed.

Pæderus riparius *Linn.* – Generally distributed, though decidedly scarce on the peat mosses throughout the district. The species is recorded by Canon Fowler from only one locality (York) north of the Fens (Col. Brit. Is., Vol. II., p. 323.)

Evæsthetus ruficapillus *Lac.*—Barton Moss. Frequent in moss shakings.

Stenus ater *Mann.*—Confined for the most part to chalky districts in the south and south-east of England, is taken not uncommonly at Crossens and Birkdale.

S. atratulus *Er.*—Recorded by Canon Fowler from the Southport sandhills (Col. Brit. Is., Vol. II., p. 339.)

S. pusillus *Er.*—Southport district.

S. exiguus *Er.*—Birkdale. Rare. There appear to be no records for this species intermediate between Burton-on-Trent and Lincoln, and the Tay and Solway districts of Scotland.

Bledius fuscipes *Rye.*—Very common in damp hollows amongst the sandhills throughout the district.

B. longulus *Er.*—Birkdale sandhills. Rare.

B. fracticornis *Payk.*—This local and as a rule scarce species occurs sparingly at Birkdale and Southport. Recorded also from Crosby by F. Archer.

B. opacus *Block.*—Also as a rule uncommon, is found rarely on the Birkdale sandhills.

Platystethus cornutus *Gyll.*—A single example from Hightown in May, 1900. Manchester appears to be the only other northern record for this species.

Oxytelus inustus *Grav.*—Birkdale.

Trogophlœus rivularis *Mots.*—Birkdale sandhills. Rare.

Thinobius brevipennis *Kies.*—Birkdale sandhills. Very rare.

Homalium rugulipenne *Rye.*—This very local species is taken commonly on the shore from Crosby to Southport, more especially during winter. It also occurs along the coast of the Wirral from New Brighton to Hoylake.

H. oxyacanthæ *Grav.*—Hightown and Birkdale. Rare.

Proteinus macropterus *Gyll.*—A single specimen at Birkdale in October, 1899.

Pseudopsis sulcata *Newm.*—This usually rare beetle is not uncommon in Southport, quite at the bottom of heaps of garden refuse.

Clambus pubescens *Redt.*—Southport, in garden refuse.

C. armadillo *De G.*—Southport, in haystack refuse.

C. minutus *Sturm.*—A single specimen by sweeping wet grass near Southport.

Agathidium marginatum *Sturm.*—Several specimens of this somewhat scarce insect have been captured in the neighbourhood.

Anisotoma ovalis *Schmidt.*—Southport, July, 1899.

A. rugosa *Steph.*—One example of this very rare insect was obtained by evening sweeping at Southport in October, 1901.

A. ciliaris *Schmidt.*—Always a rare beetle. Occurs occasionally on the Birkdale and Southport sandhills.

A. furva *Er.*—This exceedingly rare insect was not uncommon in the same habitat as the last during the autumn of 1902. A single specimen also occurred to us at Hoylake in September, 1896.

Hydnobius punctatissimus *Steph.*—First recorded as British from this district by the late Mr. F. Archer, who obtained it by sweeping near the Railway Station at Hightown, in September, 1862, has been taken sparingly by Mr. Wilding at Crosby, and not uncommonly by ourselves on the Birkdale and Southport sandhills during the autumn.

Tychus niger *Payk.*—Apparently not recorded from any locality north of Manchester, is somewhat rare in moss, etc., in the Southport district.

Nephanes titan *Newm.*—Southport. Garden refuse, common.

Olibrus æneus *Fab.*—Southport district. Not uncommon.

Hister stercorarius *Hoff.*—A specimen of this rare species was recorded from the neighbourhood of Liverpool by Mr. E. R. Curzon (Col. L'pool Dist., p. 48.) It has also occurred to us on the Birkdale sandhills.

H. bissexstriatus *F.*—One specimen. Southport sandhills.

H. 12-striatus *Sch.* Single examples from Hightown (J. H. Smedley). Birkdale and Southport sandhills.

Gnathoncus nannetensis *Mars.* Birkdale sandhills. Rare.

Saprinus quadristriatus *Hoff.* Birkdale and Southport sandhills. Scarce.

S. maritimus *Steph.*—Hightown and Crosby.

Brachypterus gravidus *Ill.*—Common, though local, in the Southport district on the Yellow Toadflax (*Linaria vulgaris Mill.*).

Monotoma rufa *Redt.*—This species, whose only recorded Northern locality is South Shields (Col. Brit. Is., Vol. III., p. 274). was abundant in vegetable refuse in the Southport district in 1902.

M. longicollis *Gyll.*—Birkdale, in garden refuse. Rare.

Antherophagus pallens *Gyll.*—Birkdale sandhills.

Cryptophagus umbratus *Er.*—Southport. Rare.

Atomaria fimetarii *Herbst.* - This usually scarce little clavicorn is abundant in fungi in a locality bordering on the Birkdale sandhills now under process of demolition.

Dermestes vulpinus *Fab.* -Taken in carrion on the Formby shore by Mr. W. E. Sharp. The species has also occurred at Liverpool, Wallasey, and Hoylake.

Aphodius plagiatus *Linn.*—The type form, with the red patch on each elytron, is not uncommon at Birkdale with the unicolorous black var. **concolor** *Schilsky* (**niger** *Ill.*)*, which is abundant locally, burrowing in the sand

*Frank Bouskell: The Variation and Distribution of the Genus Aphodius, *Ill.* 1901.

in damp hollows amongst the dunes. Dr. Ellis has met with the species under similar conditions at Wallasey (Col. L'pool Dist., p. 54), whilst it has also been recorded by Mr. Sharp from the Hightown shore, and by Mr. Tomlin from the Formby shore, in dead animals.

A. scrofa *Fab.*—Exceedingly rare as British; only recorded from Southport by the late Mr. Joseph Sidebotham, and from Pentire Point, Cornwall (Stephens).

Rhizophagus parallelocollis *Er.*—A single specimen was taken crawling on the bare sand on the Southport foreshore.

R. cœruleipennis *Sahl.*—Crosby.

Heptaulacus villosus *Gyll.*—Birkdale and Southport sandhills. Very rare.

Oxyomus porcatus *Fab.*—Recorded by Dr. Ellis from dry dung on the Crosby shore. Occurs somewhat rarely in garden refuse in the Birkdale and Southport district.

Ammœcius brevis *Er.*—Extremely local, and, as a rule, scarce on the Birkdale sandhills. Abundant during the present year.

Psammobius sulcicollis *Ill.*—Common on the sandhills.

Ægialia rufa *Fab.*—In profusion, very locally, on the Birkdale sandhills in June, 1902.

Elater balteatus *Linn.*—May be included on account of its habitat, the species being common in the neighbourhood under loose masses of peat, where it may be found in all its stages.

Ptilinus pectinicornis *Linn.* One near Southport, in June, 1902. A single specimen occurred also to Dr. C. R. Billups a few years ago on Stockton Heath, near Warrington.

Aromia moschata *Linn.* —Although scarcely a rarity in the land, we are tempted to include this beautiful longicorn in our list, the species being very common and destructive in the Birkdale district.

Cryptocephalus fulvus *Goeze.*—Very common on the Southport foreshore.

Longitarsus suturellus *Duft*—This species, like the last, has not apparently been previously recorded from the north-west of England. It is fairly common in our district.

Phyllotreta exclamationis *Thunb.*—Birkdale.

Mantura chrysanthemi *Koch.*—This local and usually rare beetle occurs abundantly in a restricted area near Southport on sheeps' sorrel (*Rumex acetosella Linn*).

Psylliodes marcida *Ill.* Hightown and Freshfield, under cabbages washed up on the shore.

Salpingus æratus *Muls.* A scarce species. Has been taken by sweeping under hawthorn at Freshfield, July, 1898.

Anthicus bimaculatus *Ill.*—Since this hitherto rare heteropteron was first captured in our district in 1859 it has been several times recorded, and latterly in some numbers.

Apion confluens *Kirby.*—Three specimens of this usually southern insect have been taken near Southport.

A. loti *Kirby.*—Southport district.

A. tenue *Kirby.*—Formby, August, 1898.

A. pubescens *Kirby.*—A local species. Is not uncommon on the Southport foreshore.

Sitones humeralis *Steph.*—Crossens. Rare.

S. meliloti *Walt.*—Southport district. Rare.

S. suturalis *Steph.*—Scarce.

Hypera suspiciosa *Herbst.*—Birkdale and Southport. Scarce. All the insects are of a remarkably elongate and narrow form, and very unlike the type, a peculiarity which appears to extend to other localities in the neighbourhood, since the same characteristic feature is apparent in specimens captured by us at Hilbre Point, Hoylake, in 1896, 1897, and 1901.

Orchestes saliceti *Payk* -Recorded from the Southport district by Mr. Arthur Reston (Col. Brit. Is., Vol. V., p. 263). Two examples occurred to us at Birkdale during June, 1898.

Bagous limosus *Gyll.*—A short series of this scarce and local weevil was obtained by shaking water-weeds near Birkdale in May, 1900. Scarborough (Lawson) appears to be the only other northern record for the species (Newbery, Ent. Record, Vol. XIV., p. 154.)

Ceuthorrhynchus arcuatus *Herbst.*—This very rare species was taken at Southport by Mr. Prescott, and recorded by Mr. Joseph Chappell (Col.Brit.Is., Vol. V., p. 357).

Amalus hæmorrhous *Herbst.*—Abundant on the Southport foreshore.

Rhinoncus gramineus *Fab.*—As a rule, both local and scarce. This species occurs commonly in the Southport district.

Limnobaris T.-album *Linn.*—Fairly common on the Southport foreshore. All the specimens differ from the type in being of a considerably smaller form.

Dryocætes alni *Georg.*—Southport. Rare. In bark of alder (*Alnus glutinosa, Linn*).

Bibliography.

In addition to the many records from the district contained in Canon W. W. Fowler's *Coleoptera of the British Islands* (1887-1891), reference may be made to the following publications :—

The Coleopterous Fauna of the Liverpool District, by J. W. Ellis, L.R.C.P., F.E.S. (Trans. Liverpool Biological Soc., vols. II. and III.), Liverpool, 1888-1889. In this

catalogue are incorporated the lists of (1) *Geodephagous* and (2) *Hydradephagous Coleoptera of the Liverpool District*, by the late C. S. Gregson (Trans. Historic Soc., Lancashire and Cheshire), 1861-1862; *Coleoptera collected in the neighbourhood of Liverpool*, by the late F. Archer (Liverpool Naturalists' Scrap Book), 1863; and the records of other local workers.

The Hydradephaga of Lancashire and Cheshire, by W. E. Sharp, F.E.S. ("Naturalist") Leeds, 1892.

"*Coleoptera*" in *The Entomology of the Liverpool District*, by W. E. Sharp, F.E.S. (British Association Handbook, Liverpool Meeting, 1896), Liverpool, 1896.

The Coleoptera of Southport and District, by G. W. Chaster, M.R.C.S. (4th Rep. Southport Soc. Nat. Science), Southport, 1899.

Various notes in Entomological periodical literature, by Drs. J. H. Bailey, G. W. Chaster, and J. W. Ellis, and Messrs. J. Chappell, B. Cooke, C. S. Gregson, J. Sidebotham, W. E. Sharp, E. J. B. Sopp, J. R. le B. Tomlin, R. Wilding, and others.

ARANEÆ.

By A. R. Jackson, M.B., B.Ch., M.Sc.

In 1859, when the first edition of Dr. McNicoll's "Handbook for Southport" was published, some work had already been done in connection with the local spiders. For this the Rev. O. Pickard-Cambridge, F.R.S., was responsible.

He found 80 species of spiders, several of which have not occurred here since. Later, a considerable collection was made by Mr. Cecil Warburton, of Christ's College, Cambridge. Work has also been done by Mr. H. Freston, of Manchester, and by myself.

The local list now includes over 190 species, out of about 530 British forms, so that it is plain that our present total is not a gigantic one, and that much work remains to be done.

The area investigated contains three different kinds of surface conditions, viz. :—

1st. The sandhills and coast line.
2nd. The inland "mosses."
3rd. Ince Blundell woods.

In only the first of these has much work been accomplished, and no doubt even here many new and rare forms await discovery.

The mosses might almost be described as virgin soil. It must not be forgotten that where these mosses now stand once lay a great marshy fenland. Remains of this still exist near Rufford, and, as practically no collecting has been done here, many spiders peculiar to fen districts possibly exist in this locality.

At Ince Blundell there are many imported trees and shrubs, and, as one would naturally expect, the fauna differs somewhat from that of the clumps of copse-wood scattered over the mosses. As Mr. Cambridge's collections were made years ago, many of his captures were then new to Britain, some of them being new to science.

Even in recent times novelties keep cropping up, and there is no doubt that, when the district is thoroughly investigated, its spider fauna will bear comparison with that of many much larger areas. When I say that many *county* lists are only a little over 200 species strong (some even less than this), it will be seen that our 190 forms, obtained with so little work in so small an area, point out the district as an extremely rich one.

Perhaps our chief weakness lies in the fact that little summer collecting has been done, both Mr. Warburton and myself having only been able to work in early spring and autumn.

The following are the names of some of the best local species :—

DYSDERIDÆ.

Harpactes hombergii *Scop.*—Rare. In Hesketh Wood.

Oonops pulcher *Templ.*—Rare. Among grass in Hesketh Wood. It is worthy of note that the six-eyed spiders are all infrequent near Southport.

Drassidæ.

Prosthesima latreillii *Clk.*—Among starr grass on sandhills.

P. electa *Clk.*—With latreillii. New to Britain in 1859. It has also occurred on the coasts of Cumberland, Norfolk, and Glamorgan.

Drassus blackwallii *Shor.*—Found wandering about in outhouses at night,

D. troglodytes *Koch.*—Common on the sandhills.

Clubiona trivialis *Clk.*—Not rare among grass on the sandhills.

C. stagnitilis *Kulcz.*—Rare on the sandhills.

C. phragmitis *Clk.*—Swarms in Rufford swamp.

C. neglecta *Cb.*—Occasional on the sandhills. A very rare spider.

C. lutescens *Westr.*—Common everywhere.

C. diversa *Cb.*—Not rare on the sandhills.

Chiracanthium lapidicolens *Sim.*—Frequent at Ainsdale on the sandhills.

Agroeca proxima *Cb.*—Very common everywhere.

A. brunnea *Bl.*—Not rare among starr grass.

A. gracilipes *Bl.*—Common at Ainsdale in one particular slack. ("Slack" is the local name for a damp, willow-grown hollow in the sandhill area.)

A. Celans *Bl.*—One female in company with last.

Micariosoma festivum *Clk.*—A few specimens in an old stone quarry at Parbold.

Agelenidæ.

Argyroneta aquatica *Bl.*—Frequent in pools and ditches.

Coelotes atropos *Wlk.*—Parbold.

Agelina longipes *Carp.*—New to science in 1876, still unique. This specimen was found inside a house in Roe-lane. It is a very large handsome form.

Tegenaria atrica *Clk.*—Botanic gardens, spreading into the country round. Probably imported.

THERIDIIDÆ.

Theridion tepidariorum *Clk.*—Common in greenhouses.

T. bimaculatum *L.*—Frequent on the sandhills.

T. pulchellum *Walck.*—Ince Blundell woods.

T. denticulatum *L.*—Ince Blundell woods.

ARGIOPIDÆ.

Cnephalocotes pusillus *Cb.*—Sandhills amongst grass. New to Britain in 1900. Has never occurred elsewhere in the kingdom.

C. curtus *Sim.*—In the marsh lying between the sea and the sandhills. The only previous British records were from Scotland and Ireland.

Areoncus humilis *Bl.*—Accompanying the last named.

Troxochrus cirrifrons *Cb.*—Occasional on the sandhills, accompanying **T. scabriculus** of which it is possibly a variety.

Entelecara Thorellii *Westr.* Sandhills. This was new to Britain when discovered. It has since been recorded only from Dublin.

Prosopotheca monoceros *Wid.* Frequent in sandhills during autumn.

Cornicularia vigilax *Bl.* Found amongst moss bordering the Birkdale slacks.

Gonatium rubellum *Bl.* Occasional amongst grass in Scarisbrick woods.

Gongylidiellum vivum *Cb.* Amongst moss in the Birkdale slacks.

Typhochrestus dorsuosus *Cb.*—Common on sandhills. New to England, *sensu stricto* 1900.

Hilaira uncata *Cb.*—Amongst moss in Birkdale slacks.

Tmeticus prudens *Cb.*—Amongst starr grass on the Southport sandhills.

T. sylvaticus *Bl.*—Found in Ince Blundell woods.

T. expertus *Cb.*—Obtained from Rufford swamps.

T. huthwaitii *Cb.*—Not rare in swampy places.

T. hardii *Bl.*—Very common at Ainsdale. Seventy specimens were taken in one afternoon on the sandhills. Also recorded from Berwick and Cumberland.

T. warburtonii *Cb.*—When discovered at Birkdale this was new to science. It has since occurred in Cumberland and Glamorgan.

Microneta cauta *Cb.*—One male on the Southport sandhills in 1900. This was new to science. It has since been taken in Glamorganshire.

Lepthyphantes tenebricola *Wid.*—Amongst grass on sandhills.

Floronia bucculenta *Clk.*—Common in the autumn of 1900 in Hesketh wood, Southport.

Nesticus cellulanus *Clk.*—Amongst Iris leaves near the lake, Botanic Gardens, Churchtown.

Epeira umbratica *Bl.*—Under bark of trees, Ince Blundell.

E. redii *Clk.*—Occurs rarely amongst herbage on the sandhills. A moorland form.

Thomisidæ.

Xysticus pini *Hahn.*—Very rare. On the ground at grass roots.

X. erraticus *Bl.*—Occasional on the sandhills.

Tibellus oblongus *W.*—Very abundant amongst starr grass on the sandhills.

Sparassidæ.

Heteropoda venatoria. This handsome exotic was found commonly in 1898 in a Birkdale nursery garden. It was breeding freely in a conservatory. The gigantic females carry their egg-cocoons about with them.

Lycosidæ.

Trochosa picta *Hahn.* Common on the sandhills, where it excavates long tunnels.

T. leopardus *Sund.*—Rare. Amongst moss on the Birkdale slacks.

Tarentula miniata *Clk.*—Common on the sandhills. A very local spider. Occurring also in North and South Wales.

Pirata latitans *Bl.*—Ince Blundell woods, amongst fallen pine needles.

ATTIDÆ.

Marpessa pomatia *W.*—A single specimen, captured in 1855, long remained unique as British. It has since occurred abundantly in the Fens of Cambridge and Lincoln. If the "Mosses" contiguous to Southport were well worked this species might occur in numbers.

Attus pubescens *Cb.*—Not common, found amongst grass and herbage.

Attue saltator *Sim.*—Common in suitable localities on the sandhills. The best leaper among British spiders. Though very small, about $\frac{1}{10}$th of an inch in length. it can clear at least a foot.

MOLLUSCA.

By G. W. CHASTER, M.R.C.S.

The district being destitute of any highly calcareous soil and of large wooded tracts, the land mollusca present no noteworthy features, being comparatively few in number and of no special rarity. The fresh water species are fairly well represented.

In striking contrast to these the marine forms are numerous and interesting, many that are usually considered rare occurring here quite commonly.

I propose confining my remarks to such species as have been found alive or cast up dead on the shore. Such a list may at first seem scarcely worthy of being offered to the scientific zoologist, but a careful consideration will reveal the fact that although it is based on a collection of shells for the most part dead, it none the less represents very fairly the molluscan fauna of what may legitimately be included in the marine area of the district. Doubtless systematic dredging, accompanied by careful records of molluses obtained *alive*, affords the

only basis for a really scientific marine fauna, but those who have had experience of dredging in the Irish Sea would be the first to acknowledge the difficulties and the immensity of such a task. As an example I may cite a single instance. For many years the Liverpool Marine Biology Committee has conducted dredgings over a great part of the sea area between the Isle of Man and the English and Welsh coasts, and yet so far as I can ascertain no living specimen of *Scala Turtonis* has ever been obtained. Still fresh shells of this species are so frequently cast up on our shore that it must live in considerable numbers somewhere in the vicinity. And on the other hand the dredging operations that have been made within a distance of 25 miles west of Southport have yielded very few testaceous molluscs not included in the following list.

With this apology I have ventured to offer the list, which may be of interest and use to the visitor who, during a longer or shorter stay, wishes to add to his collection, and to whom our shore will prove not unworthy of careful search.

It may not be out of place to offer a few practical hints on the best methods of collecting. Of course the most favourable opportunities for work occur during and after storms. These often cast up on the shore a remarkably rich harvest of the spoils of the deep: not only are shells thickly strewn on the sand, but masses of tangled zoophytes, etc., may be found, attached to which are species from comparatively deep water, such as one would scarcely expect to meet with on the shore. But even during the summer a considerable amount of collecting can be done. The larger forms are chiefly to be sought along the landward slopes of the depressions, in which run the shallow streamlets that drain off the tidal water. These depressions vary from time to time in their position, but usually the nearest has its origin opposite the Palace Hotel, Birkdale, and runs into the sea opposite the lifeboat station. This is succeeded by many others along the shore to Ainsdale. Here such

forms as *Scala Turtonis*, *S. clathrus*, *Aporrhais pes-pelicani*, *Actæon tornatilis*, *Ocinebra erinaceus*, etc., are to be found amongst the heaps of *Mactra*, *Tellina*, and *Turritella*. For the smaller species the fine shelly debris accumulated near the high water mark of spring tides or between the ripple ridges in the sand is to be collected and carefully searched at home. Amongst these "small fry" the usually rare *Eulima glabra* is fairly common, whilst *Odostomia ascaris*, *A. minor*, *Hyala vitrea*, *Philine nitida* and *P. angulata* are amongst many other interesting forms obtainable.

Among the numerous workers who have contributed to our knowledge of the local mollusca may be mentioned the late T. Glover and Isaac Byerley, Messrs. C. H. Brown, R. D. Darbishire, A. Leicester, J. T. Marshall, and Dr. Baildon.

The nomenclature adopted is that recently drawn up by the Conchological Society of Great Britain and Ireland.

Land and Freshwater Mollusca.

Arion ater *L.*—Common.
A. subfuscus *Drap.*—Common.
Amalia sowerbyi *Fér.*—Local.
Limax maximus *L.*—Common.
Agriolimax agrestis *L.*—Very common.
A. lævis *Mull*—Common on the sandhills.
Vitrina pellucida *Mull.*—Sparingly almost everywhere.
Hyalinia cellaria *Mull.*—Common.
H. alliaria *Miller.*—Common.
H. nitidula *Drap.*—Common.
H. crystallina *Mull.*—Common.
H. fulva *Mull.*—Moderately common.
H. nitida *Mull.*—Rare and local.
H. excavata *Bean.*—Parbold. Rare.
Helix rotundata *Mull.*—Abundant.
H. pygmæa *Drap.*—Birkdale sandhills.
H. pulchella *Mull.*—Common.
H. aspersa *Mull.*—Common.

H. nemoralis *L.*—Common on the sandhills. Mr. R. Drummond has taken reversed specimens on the sandhills.

H. hortensis *Mull.*—Lydiate.

H. hispida *L.*—Common.

H. caperata *Mont.*—Common.

H. virgata *Da Costa.*—Abundant.

Pupa cylindracea, *Da Costa.*—Common locally.

P. muscorum *L.*—Abundant on the Sandhills.

Vertigo pygmæa *Drap.*—Rare.

V. antivertigo *Drap.*—Scarce.

Cochlicopa lubrica *Mull.*—Common.

Succinea elegans *Risso.*—Common.

S. putris *L.*—Local.

Carychium minimum *Mull.*—Common.

Planorbis fontanus *Lightfoot.*—Not common.

P. nautileus *L.*—Common where it occurs.

P. albus *L.*—Common.

P. spirorbis *Mull.*—Occasionally plentiful.

P. vortex *L.*—Common.

P. carinatus *Mull.*—Local.

P. umbilicatus *Mull.*—Local.

P contortus *L.*—Very local.

Bullinus hypnorum *L.*—Common.

Physa fontinalis *L.*—Common.

Limnæa peregra *Mull.*—Abundant.

L. auricularia *L.*—Canal near Rufford.

L. stagnalis *L.*—Local.

L. palustris *L.*—Common.

L. truncatula *Mull.*—Common.

Ancylus fluviatilis *Mull.*—Common.

Velletia lacustris *L.*—Local. Parbold, etc.

Viviparus contectus *Millet.*—Common in the "Boundary Brook," a drain passing under the road beyond Kew Gardens.

Bythinia tentaculata *L.*—Abundant.

Valvata piscinalis *Mull.*—Common.

V. cristata *Mull.*—Fairly common.

Anodonta cygnea *L.*—Not common.

A. anatina *L.*—Not common.

Sphærium corneum *L.*—Abundant.
S. rivicola *Leach.*—Common in canal at Rufford.
S. pallidum *Gray.*—Occurs sparingly in the canal between Burscough and Rufford.
S. lacustre *Mull.*—Common.
Pisidium amnicum *Mull.*—Common.
P. fontinale *Drap.*—Common.
P. pusillum *Gmel.*—Common.

Marine Mollusca.

Nucula nucleus *L.*—Valves common. Perfect specimens rare.
N. nitida *G. B. Sow.*—Very rare.
Nuculana minuta *Mull.*—Very rare.
Anomia ephippium *L.*—Small specimens.
Glycymeris glycymeris *L.*—Very rare.
Mytilus edulis *L.*—Abundant.
Modiolus modiolus *Lam.*—Not uncommon.
M. adriaticus *Lam.*—Very rare.
Modiolaria marmorata *Forbes.*—Rare in *Ascidia*.
M. discors *L.*—Very rare.
Ostrea edulis *L.*
Pecten pusio *L.*—Very rare.
P. varius *L.*—Very rare.
P opercularis** *L.*—Occasional.
P tigerinus *Mull.*—Valves occasional.
Lima loscombi *G. B. Sow.*—Very rare, valves only.
Astarte sulcata *Da Costa.*—Occasional.
Arctica islandica *L.*—Valves, common.
Montacuta bidendata *Mont.*—Very common.
Tellimya ferruginosa *Mont.*—Very rare.
Lepton nitidum *Turton.*—Rare.
L. clarkiæ *Clark.*—Very rare.
Syndosmya prismatica *Mont.*—Rare.
S. alba *Wood.*—Very common, specimens often fine.
Scrobicularia plana *Da Costa.*—Common. Mouth of Alt and near Crossens.
Tellina donacina *L.*—Rare.
T. tenuis *Da Costa.*—Very common.

T. fabula *Gron.*—Very common.
Macoma balthica *Leach.*—Abundant.
Donax vittatus *Da Costa.*—Abundant.
Mactra stultorum *L.*—The type and the var. *cinerea* are abundant.
Spisula solida *L.*—Not common.
S. elliptica *Brown.*—Very rare.
S. subtruncata *Da Costa.*—Extremely abundant. Very large specimens have been taken.
Lutraria elliptica *Lam.*—Valves common.
Lucinopsis undata *Penn.*—Much rarer than formerly.
Dosinia lupina *L.*—Rare.
Venus fasciata *Da Costa.*—Very rare.
V. ovata *Penn.*—Valves not uncommon.
V. gallina *L.*—Common.
Tapes virgineus *L.*—Valves rare.
T. decussatus *L.*—Very rare.
Gouldia minima *Mont.*—Very rare.
Cardium echinatum *L.*—Common.
C. edule *L.*—Abundant.
C. norvegicum *Speng.*—Rare.
Psammobia ferroensis *Chem.*—Frequent.
Mya arenaria *L.* Abundant in the marine lake and at Formby.
M. truncata *L.*—Valves common. Rarely living.
Sphenia binghami *Turton.*—Very rare.
Corbula gibba *Ol.*—Common.
Solecurtus scopula *Turton.*—Very rare.
S. antiquatus *Pult.*—Very rare.
Pharus legumen *L.*—Common.
Cultellus pellucidus. *Penn.*—Very rare.
Ensis ensis *L.*—Common.
E. siliqua *L.*—Very rare.
Solen vagina *L.*—Once living. Valves common.
Saxicavella plicata *Mont.*—Very rare.
Saxicava rugosa *L.*—Rather rare.
Barnea candida *L.* Valves abundant. Occasionally alive.
Zirfæa crispata *L.*—Valves rare.
Teredo navalis *L.*—Very rare.

T. megotara *Hanley.*—Occasionally abundant in drift wood.

Martesia striata *L.*—Very rare.
Pandora inæquivalvis *L.*—Very rare.
Cochlodesma prætenue *Pult.*—Very rare.
Thracia fragilis *Penn.*—Rather scarce.
T. convexa *W. Wood.*—Very rare.
Dentalium entalis *L.*—Occasional.
D. vulgare *Da Costa.*—Occasional.
Patella vulgata *L.*—Very rare.
Emarginula fissura *L.*—Rare.
Fissurella græca *L.*—Rare.
Gibbula cineraria *L.*—Rare.
Calliostoma montagui *W. Wood.*—Very rare.
C. granulatum *Born.*—Rare.
C. zizyphinus *L.*— Rare.
Littorina obtusata *L.*—Rare.
L. littorea *L.*—Common.
Rissoa parva *Da Costa.*—Rare.
R. inconspicua *Alder.*—Rare.
Alvania punctura *Mont.*—Very rare.
Onoba striata *J. Adams.*—Scarce.
Hyala vitrea *Mont.*—Common.
Setia obtusa *Cant.*—Scarce.
Cingula semistriata *Mont.*—Rare.
Paludestrina stagnalis *Bast.*—Abundant.
P. ventrosa *Mont.*—Not common.
Adeorbis subcarinatus *Mont.*—Very rare.
Capulus hungaricus *L.*—Rare.
Trivia europæa *Mont.*—Rare.
Natica catena *Da Costa.*—Common.
N. alderi *Forbes.*—Scarce.
Velutina lævigata *Penn.*—Very rare.
Scala turtonis *Turt.*—Common.
S. clathrus *L.*—Common.
Aclis minor *Brown.*—Common.
A. ascaris *Turton.*—Scarce.
Odostomia unidentata *F. and H.*—Very rare.
O. turrita *Han.*—Rare.
Liostomia clavula *Lov.*—Very rare.

Brachystomia rissoides *Han.*—Rare.
Ondina divisa *J. Adams.*—Rare.
Oda dolioliformis *Jeff.*—Very rare.
Pyrgulina indistincta *Mont.*—Common.
Pyrgostelis interrupta *Totten.*—Very rare.
P. interstincta *Mont.*—Rather rare.
Spiralinella spiralis *Mont.*—Rare.
Turbonilla pusilla *Phil.*—Not common.
Eulimella commutata *Monter.*—Very rare.
Eulima glabra *Da Costa.*—Common.
Cæcum glabrum *Mont.*—Rare.
Turritella communis *Lam.*—Abundant.
Aporrhais pes=pelicani *L.*—Not uncommon.
Buccinum undatum *L.*—Common.
Neptunea antiqua *L.*—Common.
Tritonofusus gracilis *Costa.*—Scarce.
T, propinquus *Alder.*—Rare.
Ocinebra erinaceus *L.*—Not common.
Trophon clathratus var. **truncata** *Str.*—Rare.
Purpura lapillus *L.*—Not common.
Nassa reticulata *L.*—Rare.
N. incrassata *Str.*—Scarce.
Bela turricula *Mont.*—Scarce.
Mangilia nebula *Mont.*—Rare.
Bellardiella gracilis *Mont.*—Rare.
Actæon tornatilis *L.*—Common.
Tornatina umbilicata *Mont.*—Very rare.
T. obtusa *Mont.*—Occasionally in some numbers.
Diaphana hyalina *Turton.*—Very rare.
Scaphander lignarius *L.*—Very rare.
Bullinella cylindracea *Penn.*—Scarce.
Philine angulata *Jeff.*—Very rare.
P. nitida *Jeff.*—Common.
P. aperta *L.*—Common.
Eolis papillosa *L.*
Galvina picta *A. and H.*
Facelina drummondi *Thomp.*
Archidoris tuberculata *Cuv.*
Lamillidoris bilamelleata *L.*
Leuconia bidentata *Mont.*—Very rare.

Loligo media *L.*—Very rare.
Sepia officinalis *L.*—Very rare.
Sepiola atlantica *d'Orb.*—Very rare.

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THE MARINE FAUNA AND FISHERIES OF THE DISTRICT.

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With a Plan, and Sections.

INTRODUCTORY NOTE.

Southport occupies a central and commanding position in the middle of the Lancashire coast, facing the widest part of the Irish Sea. It has long been intimately united with the neighbouring port of Liverpool in its fishing interests and its scientific researches; and as no natural district can be defined around Southport that does not include Liverpool Bay, the marine investigations which have been carried on since 1885 by a committee of local naturalists are applicable in their entirety to the Southport coast.

At the Liverpool Meeting of the British Association in 1896 a list of 2,090 marine animals which had been found in the district was published. That list has since been considerably enlarged, as will be shown below, and it seems the natural course, and the one which will be most convenient both to local naturalists and also to members of the British Association who may be

interested in our marine fauna, that the article given in the B. A. Handbook for the 1896 meeting should be taken as the basis of the present account, and should be corrected, completed, and brought up to date.

Similarly as regards the Fishing Industries, the local Sea Fisheries District (Lancashire and Western), in which Southport is included, has its official centre in Preston, and the headquarters of the inspecting steamer "John Fell" are at Fleetwood. But still Southport is a typical example of the Lancashire portion of the district, and the statistics and results published in the Superintendent's reports and those of our Sea Fish Hatchery and Laboratories, are entirely applicable to the purpose of the present article, and are made full use of below.

Our thanks are due to our fellow workers on the Marine Biology of the district, whose names are given below, in connection with their special work, and also to Mr. R. A. Dawson, the Superintendent of the Sea Fisheries District, for information in regard to his department. Mr. R. Houldsworth, of Marshside, has kindly supplied some of the details in regard to the Shrimp Fishery, which has sometimes been described as the staple industry of Southport.

The fauna of the sea comprising Liverpool Bay and including the Southport district has been actively investigated during the last eighteen years by the Liverpool Marine Biology Committee, assisted by several members of the Southport Society of Natural Science. Commencing in 1885 with the shores of the Mersey and the sandbanks and channels in the immediate neighbourhood of Liverpool, they gradually extended their area to Puffin Island and Anglesey (1887) in the one direction, and to the Isle of Man (1892) in another. The extended "L.M.B.C. District" now comprises the whole of that northern larger region of the Irish Sea, bounded north, east, south and west by Scotland, England, Wales, and Ireland, and in the middle of which lies the Isle of Man (see Plan at end of article).

This northern part of the Irish Sea is classic ground to the marine biologist, as being the scene of the pioneer dredging work of Professor Edward Forbes nearly 70 years ago. Some few parts of our area were also investigated more minutely later on by Professor Forbes in conjunction with Mr. R. MacAndrew, who was a Liverpool merchant, well known in science from the extensive dredging operations he conducted with his yacht along the western coasts of Europe from the Mediterranean to the north of Norway. The greater part of the above area, however, had never been properly explored when the Local Committee began work in in 1885; and that work is by no means finished, as some parts are still comparatively unknown ground to the naturalist. The Ulster Fisheries and Biology Association recently established at Belfast, with a Marine Laboratory at Larne, will co-operate in the future by exploring the western portion of the district. Taken as a whole it is an interesting region, from the considerable diversity of shore, of depth, and of bottom which it presents, and, moreover, it possesses an abundant fauna, including a number of rare forms and some not previously known from the British seas.

The accompanying Plan shows the zones of depth in the district, 0-10, 10-20, 20-50, and upwards of 50 fathoms, being separated from one another.

The most extensive shallow-water deposit is sand. In most localities along the coasts of Lancashire, Cheshire, and North Wales, from the seashore out to the 10-fathom contour, the bottom is formed of more or less pure quartz sand.

Further out, however, between 10 and 20 fathoms, the sand becomes greatly mixed with mud, and much diversified by large tracts of shelly deposits or by patches of gravel, and the fauna on the bottom also becomes much more abundant. In some spots, at about 20 fathoms, it is made up over considerable areas almost entirely of Ophiuroids (*Ophiocoma nigra* and *Ophiothrix fragilis*), which fill the dredge haul after haul. At two localities off the Isle of Man, viz., along the east coast

from Clay Head to St. Annes Head, and off the west coast between Contrary Head and Niarbyl, at depths between 10 and 20 fathoms, are great nullipore deposits formed of the stony Calcareous Algæ, *Melobesia* and *Lithothamnion*, which have a most characteristic appearance and fauna.

This area of the sea bottom from 10 to 20 fathoms extends across from the North of Lancashire to the Isle of Man, so that opposite Walney Island, for example, there is a wide extent of about 50 miles in length of sea-floor at depths of not more than 15 or 16 fathoms (see Plan and Sections at end of article). Section 1, along the line A to B on the Plan, taken from Dundrum Bay in Ireland to Morecambe in Lancashire, through Douglas and Barrow, shows that the Isle of Man is connected with England by this shallow plateau, and is separated from Ireland by deep water.

Depths of over 20 fathoms are only found to the west, north, and south of the Isle of Man; and depths of from 20 to 50 fathoms give us the most varied bottom deposits of the richest fauna. As a rule the sand is more or less mixed with mud, and as the bottom goes deeper the amount of mud gets greater. When there is a considerable admixture of mud with coarse sand, it forms what is known to the trawlers as a "reamy" bottom, and that is the ground upon which the sole and some other valuable fish are generally found spawning.

Shells and other hard portions of animals play an important part in the deposits at depths of about 20 fathoms and upwards. In places the dredge comes up filled with Pecten shells, dead and alive, chiefly *P. opercularis* and *P. maximus*. At other places the deposit is practically composed of the shells of *Pectunculus glycimeris*. These and other shell beds form a rich collecting ground to the naturalist, as they support an abundant and varied fauna. Zoophytes and Polyzoa are attached to the shells, and these serve as shelter for Nudibranchs and other small mollusca, worms, and ascidians. On the whole the heterogeneous deposits support a richer fauna than the homogeneous, such as

sand or mud, and it is chiefly in the zone of depth we are now considering that the heterogeneous deposits occur.

A continuation of the deep water depression (over 50 fathoms) runs down from the Clyde sea-area, on the western side of the Isle of Man (see Plan and Sections at end of article), and gives depths of over seventy and eighty fathoms within twelve miles of land (see especially sections I., III., and IV.) The bottom of this depression is occupied by a stiff blue-grey clay-mud in which we find a peculiar fauna, including the Sea-pen *Virgularia mirabilis*, the Anemones *Sagartia herdmani* and *Paraphellia expansa*, the Echinoderms *Brissopsis lyrifera* and *Amphiura chiajii*, the Polyzoon *Triticella koeckii*, the worms *Panthalis oerstedi* and *Lipobranchius jeffreysii*, the Crustacean *Calocaris macandreæ*, and the molluscs *Isocardia cor* and *Pulsellum lofotense*.

Numbers of large sausage-like muddy tubes, formed of stratified layers of interlacing threads of mucus, in which the mud particles are closely entangled, are brought up in the dredge. These we have now proved to be the tubes of *Panthalis oerstedi*, and the living annelid has several times been found in the tubes; but most of those we dredge up are empty, and the tubes are certainly far more numerous than the worms. Possibly the explanation is that the *Panthalis* forms a tube as it lies in the mud, and then when it moves away leaves its tube behind it (one can scarcely imagine the animal dragging such a tube through this tenacious deposit), and after a time forms another in a new situation. It must also be remembered that the tube will remain long after the death of the worm.

In moderate depths, on the sides of the depression, we come upon varied bottoms of sand and sandy mud, gravel, dead shells and shell sand, nullipores and other calcareous deposits, often very largely of organic origin, on which is a rich fauna representing all the usual invertebrate groups of animals. It is from this region that the greater number of our additions to the British

Fauna have come, such as the Mollusc *Adeorbis imperspicuus*, the Crustacea *Harpinia laevis* (1894), *Eudorella nana* (1894), *Campylaspis macrophthalma* (1894), *Iphinoe tenella* (1895), *Lichomolgus albens* (1888), the Holothurian *Cucumaria planci* (1888), and the Foraminifer *Ammodiscus spectabilis* (1889).

In the shallower water around the coast, of course, very great differences in the physical conditions and in the fauna of different regions exist; for example, the sandbanks and flat expanses of muddy sand on the Lancashire coast are very different in every way from the more varied ground of the rocky southern shore of the Isle of Man or the northern coast of Anglesey. But even the comparatively uninteresting sandy wastes of Lancashire and Cheshire present some curious facts and problems to the marine biologist. We find that in the estuarine flats of the Dee, round Hilbre Island, as Lindstrom suspected to be the case on the coast of Gothland years ago, the very abundant *Hydrobia ulvæ* lays its eggs upon its neighbours' shells, probably because they are the largest and most stable objects among the shifting sand-grains around it. Then again, the masses and hummocks of sandy tubes formed on Hilbre Island by the gregarious annelid *Sabellaria alveolata* show in an interesting manner the shape, stages, rate and conditions of growth, and the importance of such formations in protecting a coast from erosion. It may also be noted that some parts of this supposed barren region, such as the shallow banks off Southport, Blackpool, and at the entrance to the Mersey and the Ribble (see sections I. and IV., eastern side), are of immense economic importance as a nursery for young food-fishes. The chief spawning grounds of our food-fishes in the Irish Sea are, on the other hand, far out in the deeper water, both to the east and the west of the Isle of Man (see Plan at end of article).

For further details as to the physical condition of this marine area, the modes of occurrence of the animals, the proceedings on the dredging and other collecting expeditions, and the results obtained, reference must be made

to the volume of "Reports upon the Fauna of Liverpool Bay," of which five have now appeared—Volume I. in 1886, Volume II. in 1889, Volume III. in 1892. Volume IV. in 1895, and Volume V. in 1900.

The great variety in the depth and other physical conditions described above leads to great differences in the fauna or assemblage of animals in the various parts of the Irish Sea, and so provides suitable localities for very different kinds of fishes, and for the different stages of the fishes' life. Rocks and sea-weeds are characteristic of the Welsh and Manx coasts, sand and mud of those of Cheshire and Lancashire. The deep, cold, and relatively salt water round the Isle of Man is very different from the less salt and sometimes much warmer waters of the shallow flats of Morecambe and Liverpool Bays. Trawling and dredging for scientific purposes has been carried on for some years (1) off Liverpool, Southport, Blackpool, and other points on the Lancashire coast, and (2) off Port Erin, and neighbouring places at the Isle of Man. The contrast in results is most marked. We have before us many records of hauls at both localities, and while Port Erin has very many species not found in Lancashire, the sandy bays of the latter show an abundance of individuals belonging to a few species which it would be difficult to match elsewhere in the district, or even possibly in Europe. Foreign naturalists who visit us and see a haul of our fish or shrimp trawl in Liverpool Bay are generally much impressed by the profusion of specimens belonging to a small number of species. A haul numbering tens of thousands of fish alone is frequently made; while when they come to Port Erin, they are equally struck by the profusion and variety of life, the relatively large number of species in one spot as shown by a haul of the dredge or small trawl.

The marine animals collected by members of the Committee and other local naturalists working at our fauna have been obtained (1) by shore collecting, and (2) by dredging and trawling expeditions. The best localities for shore collecting are the Hilbre Islands, at the entrance to the Dee estuary, various spots on the rocky

parts of the coast of North Wales and Anglesey and the south end of the Isle of Man, about Port Erin and Port St. Mary. The only place in the neighbourhood of Southport where there is a varied fauna on the shore as exposed at low tide is Hilbre, and as members of the British Association may like to visit that spot during or after the meeting, we think it well to give the following directions :—

As the tide falls it is easy to walk over the wet sands from West Kirby to the Little Eye, and then along the sandstone ridge to the Middle Island. At this point it is best to keep to the left on the firm sand exposed on the western sides of the middle and larger islands. For zoological purposes the best place is the group of rocks and stones at the extreme northern end on the largest Hilbre Island, alongside the lifeboat slip. This is almost the only patch of rock extending below low water on the sandy coasts of Lancashire or Cheshire, and here consequently are found many animals and groups of animals which are unrepresented elsewhere in the neighbourhood. The gregarious annelid *Sabellaria alveolata* builds up huge masses of reefs and hummocks, which appear, change their form, and disappear with amazing rapidity. Mussels, *Mytilus edulis*, and star fishes, *Asterias rubens*, are sometimes present in very great numbers all over the rocks and then again disappear. *Alcyonium digitatum* (both white and red varieties) is very abundant and very beautiful at Hilbre, and many other common invertebrates (sponges, anemones, tubicolous annelids, zoophytes and polyzoa), are to be found on the rocks in profusion. At a good low ebb the bunches of *Tubularia* are very beautiful, and the rare *Garveia nutans* is also found. But the chief glory of Hilbre Island is its sea-slugs or nudibranchs. At certain times they are there in great abundance, and they attain a very large size and great richness of colouring. The magnificent *Dendronotus arborescens*, the finest of our British nudibranchs, may be found up to five inches in length. Altogether over thirty species of nudibranchs are recorded from Hilbre, including such rare forms as *Lamellidoris depressa* and *L.*

proxima, *Acanthodoris quadrangulata*, *Antiopa cristata*, and *A. hyalina*, *Coryphella landsburgi*, *Cavolina conxima*, *C. olivacea*, and *C. aurantiaca*, *Cuthona nana*, *Embletonia pallida*, and *Fiona marina*.

To find most of the choicest species a really low spring tide, such as the equinoctial tides of March and September, on a calm afternoon is required. The last foot of the ebb then makes a surprising difference in the fauna that is exposed to view.

The dredging expeditions have been made for the most part in steamers, and the local naturalists have been fortunate in obtaining the use of suitable vessels for the work on various occasions from some of the Liverpool ship owners, from the Liverpool Salvage Association, and from the Lancashire Sea Fisheries Committee. Some of the earlier expeditions—lasting for several days at a time—were made in the celebrated old gun boat, "Hyæna," kindly lent by the Salvage Association, and some of the more recent trawling expeditions, both from Lancashire and off the Isle of Man, have been in the Sea Fisheries Steamer, "John Fell," by the courtesy of the Sea Fisheries Committee and the Superintendent of Fisheries, Mr. R. A. Dawson.

Probably the best idea of the nature and the objects of a dredging expedition in the Irish Sea will be conveyed by giving here a brief account of the course of procedure at each L.M.B.C. dredging station.

The plan for the day is arranged with the captain of the steamer, and when the first locality is reached the spot is determined on the chart, and the depth verified by casting the lead. Then the dredge (measuring 2 feet 6 inches by 1 foot, and weighing from 30 to 40 lbs.) is sent down with a tow-net tied on the line about 2 fathoms from the dredge. Very often a smaller dredge with a bag of cheese-cloth is sent over on the other side of the ship; and sometimes a small trawl, with a four-and-a-half foot beam, is used in place of the dredge. One or more surface tow-nets are also put out. The tow-nets, both

surface and deep, are looked after by one of the party, who, after hauling them, first turns out their contents into a clear glass jar of seawater, and then, after noting the general character of the catch and any specially conspicuous forms, strains off the water through a small bag made of very fine miller's silk and transfers the "Plankton" left adhering to the silk into a tube containing a preservative fluid formed of spirit, glycerine and water, picric acid, formaline, or other suitable media.

When the dredge is brought up it is emptied on deck, and after a note of the general character of the deposit and assemblage of animals has been taken, any specially large or rare specimens are picked out and transferred to buckets or jars of seawater, or to store bottles of spirit. Then the heap is spread out so as to form a layer not more than one or two inches in depth, and several members of the party now settle down beside it to pass the entire mass in review, inch by inch, working it across a small space of bare deck, and turning over every shell, stone, and specimen with an iron spoon, so as to ensure that nothing escapes observation and due record in the note book. In the meantime the contents of the bottom tow-net have been dealt with, and the apparatus has been lowered for a second haul, or the vessel is steaming on to a new locality. Then a fair sample of the deposit is selected for preservation (for geological work) in a small canvas bag (10 inches by 5 inches), care being taken to include some of the characteristic bottom animals' shells, hard parts of ophiuroids, polyzoa, &c. After this sample has been removed, and any special animals required have been picked out and put into store bottles, the whole of the remainder of the haul is passed gradually through our set of three sieves (meshes $\frac{3}{4}$ inch, $\frac{1}{4}$ inch, and $\frac{1}{8}$ inch respectively), which work up and down in a tall iron cylinder filled with sea-water. The sieves are disconnected and examined at intervals, and in this way many of the smaller animals of all groups are detected and picked out. Finally, the water in which the sieves have been plunging is all strained through the fine silk

net, and in this way many of the rarer bottom Copepoda are obtained, while the finer sandy muddy deposits retained by the finest sieve, or in the bottom of the cylinder, are packed in canvas bags for further examination at home. These contain, of course, many minute Mollusca, Ostracoda, and Foraminifera. By the time all these processes have been completed the dredge has usually been hauled again, and a fresh heap is lying on the deck awaiting investigation. On a successful trip the members of the party, on an average about six in number, are kept constantly occupied, each man at his own work, from the commencement of the first haul till the steamer is turned homewards, and after that the packing and labelling of specimens fill up the time until land is reached.

As full lists of the animals and plants which have been found in the district have been published within recent years, and are readily accessible, no attempt will be made here to enumerate all the species; but a short summary of the work which has been done in each group, with mention of some of the more noteworthy and rarer forms, must suffice.

Algæ.

Our Marine Algæ have been collected and worked out by Prof. Harvey Gibson, Prof. Weiss, Rev. T. S. Lea, Dr. Otto Darbishire, and others. The following are more especially noteworthy:—*Urospora bangioides*, *Stictyosiphon subarticulatus*, *Taonia atomaria*, *Phyllophora traillii*, *Bostrychia scorpioides*, *Helminthora divaricata*, *Compsothamnion gracillimum*, *Schmitziella endophlæa*, *Catenella opuntia* (with *Cystocarpia*), and *Rhodochorton seriolanum*- a species new to science described by Gibson—*Dermocarpa prasina*, Born., *Spirulina tenuissima*, Kutz., *Rivularia atra*, Roth., *Rhizoclonium riparium*, Harv., *Urospora speciosa*, Holm. and Batt., *Enteromorpha ramulosa*, Hook., *Ralfsia verrucosa*, Aresch., *Callophyllis laciniata*, Kutz., *Melobesia corallina*. *Lithothamnion colliculosum*, Fost., and *Chorda tomentosa*. Prof. Gibson has written one of the L.M.B.C. Memoirs (No. IV.), on *Codium*; and Dr. Darbishire one (No. IX.), on *Chondrus*.

Dr. Stolterfoth, of Chester, who has published several papers on the Diatomaceæ of the neighbourhood, has drawn up a list showing that 185 species have been found in the L.M.B.C. district.

Protozoa.

Mr. J. D. Siddall, the author of the report on the Foraminifera for Volume I. of the "Fauna," recorded 162 species, three of which were new to science, viz., *Miliolina spiculifera*, *Reophax moniliforme* and *Placopsilina kingsleyi*. Other species have been added since by Mr. Pearcey (8, one new to British fauna), Mr. Burgess (10 species), and Dr. Chaster, of Southport, who has described 10 species new to science, viz. :—*Reophax scottii*, *Textularia fusiformis*, *Clavulina obscura*, *Lagena dipressa*, *L. millctti*, *L. falcata*, *L. protea*, *Lingulina herdmani*, *Discorbina minutissima*, and *Pulvinulina nitidula*. All our authors agree that there is still much work to be done in the investigation of this group of microscopic animals in our district; and the group of marine Infusoria, it may be added, is still a totally unexplored field. *Astrorhiza limicola*, *Haliphysema tumanowiczii*, and *Folliculina ampulla* have been found near Port Erin; while Mr. Andrew Scott has added to the British fauna *Glugea lophii*, a sporozoon parasitic in fish.

Porifera.

The sponges of this district were worked out first by the late Mr. Thomas Higgin, of Huyton, and latterly by Dr. R. Hanitsch, formerly of Liverpool, now curator of the museum at Singapore, who, in his successive reports, added largely to the number and knowledge of the group. In a revision of the list which Dr. Hanitsch made in 1896 he enumerates in all 59 species, of which 13 are Calcarea, 2 Hexaceratina, 5 Tetractinellida, 37 Monaxonida, and 2 Monoceratina. Of these the following five species were new to science when first described in the L.M.B.C. Reports, viz. :—*Sycon asperum*, Gibson; *Aphroceras ramosa*, Carter; *Leucandra impressa*, Hanitsch; *Aplysilla rubra*, Hanitsch; and *Axinella mammillata*,

Hanitsch; and many others had not been previously recorded from these seas.

Cœlenterata.

The Hydroid Zoophytes have been worked by a number of investigators in the Irish Sea, and 91 species are recorded in the latest list, by Miss L. R. Thornely. Amongst the rarer forms may be mentioned *Garveia nutans*, *Hydranthea margarica*, *Tubiclava cornucopia*. *Dicoryne conferta*, *Perigonimus repens*, *Syncoryne eximia*, and *Campanularia calceolifera*.

Mr. E. T. Browne records 36 species of Medusæ, and about half-a-dozen Ctenophora have been taken. One especially interesting form is *Amphicodon fritillaria*, belonging to a Hydroid allied to *Corymorpha*, which (the Hydroid) has not yet been discovered anywhere in our seas. The Siphonophora *Agalmopsis elegans*, Sars. *Physalia pelagica*, and *Velella spirans* have occasionally been found, carried into the district from the Atlantic by S.W. winds. Several of these have been cast up on the beach at Southport after storms.

Amongst Alcyonaria we have *Alcyonium digitatum*, *Sarcodictyon* (*Clavularia*) *catenata*, *Virgularia mirabilis*, and *Pennatula phosphorea*; while of Actiniaria over 20 species have been recorded. The beauty of the sea anemones in some of the rocky channels and caves round the south end of the Isle of Man is celebrated amongst local naturalists. The Southport Aquarium was for years remarkably successful in showing choice specimens of the sea anemones of the neighbourhood in excellent condition.

The yellow variety (?) of *Sarcodictyon* (*Clavularia*) *catenata*, of which several colonies have been dredged off the north-west coast of the Calf Island, in 22 fathoms, is an interesting addition to our fauna. It had only been found before in Loch Fyne and at two other spots on the west coast of Scotland. It is probably the *Sarcodictyon agglomeratum* of Forbes and Goodsir.

Echinodermata.

All groups of the Echinodermata are well represented in our fauna; 35 species are recorded. *Antedon*, the rosy feather star, is found along the north coast of Anglesey, and round the Isle of Man. There are 12 species of star fishes, amongst which *Porania pulvillus*, *Stichaster roseus*, and *Palmipes placenta* are common in the deeper water to the west of the Isle of Man, where *Brissopsis lyrifera* and *Amphiura chiajii* are also found. There are eight species of Holothurians in all. *Synapta inhærens* is found in muddy shingle on the shore at Port Erin, and the little *Cucumaria planci*, first recognised as a British species in our district, is abundant in the neighbourhood of Puffin Island. *Amphiura elegans* and *Asterina gibbosa* are abundant in the coralline pools at the south end of the Isle of Man. We find the parasitic Orthonectid, *Rhopalura*, swarming in some of the specimens of *Amphiura elegans*.

Vermes.

Some groups of the marine worms have not yet been sufficiently investigated in our district. The annelids in the latest list, by Mr. J. Hornell, number 87 species, of which one, *Dasychone herdmani* has been described by Hornell as new.

Mr. Punnett has written one of the L.M.B.C. Memoirs (No. VII.) on *Lineus*, a common Nemertine worm of our district.

Drs. F. W. Gamble and H. L. Jameson have enumerated 33 species of Turbellarians from our sea, the following being noteworthy:—*Polycelis nigra*, O.F.M., *Promesostoma agile*, Lev., *Mesostoma neapolitana*, v. Gr., *Macrorhynchus croceus*, Fabr., *Provortex affinis*, Jensen, *Graffilla buccinicola*, Jam. (n. sp.) *Plagiostoma koreni*, Jensen. Mr. Beaumont recorded 22 species of Nemertines. *Sagitta* is common everywhere, *Spadella* and the Archiannelids *Dinophilus* and *Polygordius* are found at Port Erin; and various Gephyrea, amongst which is *Thalassema lankesteri*, Herdman, new to science.

Mr. Andrew Scott has been very successful in working out the Marine Trematoda found as parasites upon fishes and has added the following species to our local fauna:—*Callicotyle kroyeri*, Diesing; *Dactylocotyle pollackii*, V. Ben. and Hesse; **Diplectanum æquans*, Diesing; **Leucithodendrium somateriæ*, Levinsen; **Microcotyle labracis*, V. Ben. and Hesse; *Octobothrium merlangi*, Kuhm; *Octocotyle scombri*, Kuhm; *Onchocotyle appendiculata*, Kuhm; *Phyllocotyle gurnardi*, V. Ben. and Hesse; *Phyllonella soleæ* V. Ben. and Hesse (?); **Placunella pini*, V. Ben. and Hesse. The four marked with an asterisk (*) are new to the British fauna.

The two Brachiopoda *Terebratula caput-serpentis* and *Crania anomala* are both found in deepish water off the Isle of Man.

Polyzoa.

Miss L. R. Thornely, who has been working at this group for some years, has drawn up from her own and Mr. J. Lomas's records a list of 150 species and named varieties, a large proportion of which had not been previously found in the Irish Sea. Amongst the more interesting forms may be mentioned:—*Barentzia nodosa*, Lomas (first found and described as a new species from our district) *Loxosoma phascolosomatum* (found attached to Gephyrean worms dredged off Puffin Island), *Triticella boeckii* (on the *Crustacean Calocaris*, from deep water off the Isle of Man), *Crisia ramulosa*, and the rare forms *Lagenipora socialis*, *Membranipora nodulosa*, *Lepralia edax*, *Stomatopora incurvata*, *Mucronella peachii*, var. *labrosa*, *M. abyssicola* and *Cribrilina gattyæ*.

Higher Crustacea.

Mr. A. O. Walker has written a number of reports and papers and two "Revisions" of the Higher Crustacea (the Amphipoda, the Isopoda, and the Malacostraca) of the District. The number of species he records are as follows:—Brachyura (crabs) 28, Anomura (Hermits, &c.) 13, Macrura (Prawns, &c.) 23, Schizopoda 18, Cumacea 20, Isopoda 22, Amphipoda (Sand-hoppers) 134; in all,

258 species. The great majority of these Crustacea were unrecorded for the Irish Sea, a number were new to the British Fauna, and the following seven species were new to science when first published by Mr. Walker in the L.M.B.C. Reports:—*Diastylis rugosoides*, *Leuconopsis ensifer*, *Stenothoe crassicornis*, *Nannonyx spinimanus*, *Amphilochus melanops*, *Photis pollex*, and *Podocerus herdmani*. Amongst the other rare and interesting forms found in the district may be mentioned *Calocaris macandreæ*, *Pisa gibbsii*, *Perimela denticulata*, *Nika edulis*, *Campylaspis glabra*.

Since the B.A. 1896 list Mr. A. Scott has made the following interesting additions:—Macrura, two species, *Jaxea nocturna*, Nardo, and *Upogebia deltaura*, Leach; Cumacea, two species, *Eudorellopsis deformis*, Kroyer, and *Pseudocuma similis*, Sars; Isopoda, three species, *Phryxus abdominalis*, Kroyer, *Pleurocrypta hendersonii*, Giard and Bonnier, and *Pseudione hyndmanni*, Bate and Westwood; while Mr. Thompson adds *Micromiscus calani*, an Isopod parasitic on the Copepod *Calanus*.

Mr. Walker has also added *Mysis longicornis*, M. Edw., *Cumella pygmæa*, Sars., *Gammarus duebeni*, Lill., *Gnathia dentata*, Sars., *Iphimedia eblanæ*, Bate, *Schistomysis spiritus*, Norman, and *Janiropsis breviremis*, Sars., and *Athanas nitescens*.

Copepoda, etc.

This important group of minute Crustaceans has been worked at, in our district, for the last seventeen years by Mr. I. C. Thompson, who has published a series of reports, one of which (1893) is a "Revision" illustrated by 21 plates in which every species found in the district up to that date was figured. For many years Mr. Andrew Scott has also worked at Copepoda, and has added many previously unknown forms. Mr. Thompson has now drawn up a combined list from his own and Mr. Scott's papers, and this shows a grand total of 246 species, a very large number for one comparatively limited sea-area. Of these species, the following were new to science when first described in the L.M.B.C. Reports, viz.:—*Pseudocyclopia stephoides*, Thompson, *Herdmania*

stylifera, Thompson, *Hersiliodes puffini*, Thompson, *Cyclops marinus*, Thompson, *Stenhelia denticulata*, Thompson, *S. hirsuta*, Thompson, *S. herdmani*, A. Scott, *S. similis*, A. Scott, *Ameira attenuata*, Thompson, *A. gracile*, A. Scott, *Jonesiella hyœnæ*, Thompson, *Tetragoniceps trispinosus*, A. Scott, *Laophonte spinosa*, Thompson. *Pseudolaophonte aculeata*, A. Scott, *Laophontodes bicornis*, A. Scott, *Normanella attenuata*, A. Scott, *Cletodes monensis*, Thompson, *Idya elongata*, A. Scott, *Monstrilla rigida*, Thompson, *M. longicornis*, Thompson, *Lichomolgus maximus*, Thompson, *Collocheres elegans*, A. Scott, *Ascomyzon thompsoni*, A. Scott, *Leptosyllus herdmani*, Thompson and Scott, *Caligus brevicaudatus*, A. Scott, and *Eudactylina acanthii*, A. Scott.

The following are the 51 species added since the British Association list of 1896 by Thompson and Scott. 34 of these being fish parasites found by Mr. Scott as a result of his work at the Lancashire Fish-Hatchery :—

(1) Free swimming forms—*Euchæta marina* Prestandræ, *Candacia pectinata*, Brady, *Corycæus anglicus*, Lubbock, *Thaumaleus thompsoni*, Giesb, *Lichomolgus forficula*, Thorell, *Lichomolgus hirsutipes*, T. Scott, *Hersiliodes littoralis*, T. Scott, *Delavalia mimica*, T. Scott, *Laophonte denticornis*, T. Scott, *Stephus Scotti*, G. O. Sars, *Idya minor*, T. and A. Scott, *Ameira cilis*, T. and A. Scott, *Leptopsyllus herdmani*, Thompson and Scott, *Leptopsyllus intermedius*, T. and A. Scott, *Stenhelia intermedia*, T. Scott, *Mesochra propinqua*, T. Scott, *Canthocamptus parvus*, T. and A. Scott.

(2) Parasitic forms—*Trebius caudatus*, Kroyer, *Caligus labracis*, T. Scott, *Caligus scombri*, Bassett Smith, *Caligus diaphanus*, Baird, *Caligus minimus*, Otto, *Caligus brevicaudatus*, A. Scott, *Caligus gurnardi*, Kroyer, *Chondracanthus cornutus*, Muller, *Chondracanthus clavatus*, Bassett Smith, *Chondracanthus soleæ*, Kroyer, *Nicothoe astaci*, Aud. and M. Edwards, *Bomolochus soleæ*, Claus, *Pseudocaligus brevipedes*, Bassett Smith, *Lepeophtheirus thompsoni*, Baird, *Lepeophtheirus pollachii*, Bassett Smith, *Cyncus pallidus*, Van Beneden. *Oralien asellinus*, Linn., *Charopinus dalmannii*, Retzius, *Charopinus ramosus*, Kroyer, *Brachiella insidiosa*, Heller,

Brachiella ovalis, Kroyer, *Echthrogaleus coleoptratus*, Guerin, *Pandarus bicolor*, Leach, *Clavella labracis*, Van Ben., *Lernæenicus musteli*, Van Ben., *Lernæa minuta*, T. Scott, *Thysanote impudica*, Nordmann, *Lernæopoda bidiscalis*, W. F. de V. Kane, *Eudactylina acuta*, Van Ben., *Eudactylina acanthii*, A. Scott, *Dichelestium sturionis*, Kroyer, *Haemabaphes cyclopterinus*, Fabr., *Lernanthropus Kroyeri*, Van Ben., *Congericola pallida*, Van Ben.

The Ostracoda have not been hitherto systematically examined, but about 50 species have been recorded. There are probably many others, and Mr. A. Scott, who has undertaken the investigation of the group, has recently recorded the following additions:—*Cythere pellucida*, Baird; *C. porcellanea*, Brady; *C. gibbosa*, Brady and Robertson; *Cytheropteron humile*, Brady and Norman. He has also added a Branchiurid, *Argulus foliaceus*, Linn.

The remaining lower and some of the parasitic groups of Crustacea have not yet been fully worked out in our district. We have, however, found a new species of *Pleurocrypta* (*P. nexa*, Stebbing) on *Galathea nexa*. *Scalpellum vulgare* is not uncommon in moderate depths, usually attached to the Zoophyte *Antennularia ramosa*. *Balanus porcatus* occurs in deep water, and *Peltogaster paguri* has been found at several points along the Lancashire coast. *Nebalia geoffroyi* is sometimes dredged off Port Erin.

Mr. Andrew Scott has written an L.M.B.C. Memoir dealing with the two parasitic lower Crustaceans *Lernæa* and *Lepeophtheirus*.

Mollusca.

The Marine Mollusca of the district have been investigated by Mr. R. D. Darbishire, the late Mr. Francis Archer, Mr. Alfred Leicester, Dr. G. W. Chaster (of Southport), and others. They have recorded in all:—

Lamellibranchiata	95	species.
Gastropoda, &c.	188	,,
Cephalopoda	5	,,

Of these one—*Adeorbis imperspicuus*, Monterosato—new to Britain was first found in our district; and the following are rare shells worthy of special mention:—*Pecten testæ*, Biv., *Lepton squamosum*, Mont., *Cardium minimum*, Phil., *Propilidium ancyloide*, Forb., *Rissoa abyssicola*, Forb., *R. zetlandica*, Mont., *Odostomia minima*, Jeff., and *Eulima subulata*, Don.

Dr. Chaster has added *Eulima intermedia*, Cantr., *Neolepton obliquatum*, Monts., and *Pulsellum lofotense*, Sars.

Mr. James Johnstone has written an L.M.B.C. Memoir (No. 2) upon *Cardium*, the common cockle, an animal of considerable economic importance locally.

Forty-four species of Nudibranchs are recorded, of which 30 species have been found in the immediate neighbourhood of Liverpool, Southport, and Hilbre Island.

Tunicata.

Professor Herdman has published two reports upon the Tunicata of the district, recording in all 54 species. Of these three were new to science when first found in our district, viz., *Morchellioides alderi*, a compound Ascidian, *Polycarpa monensis*, and *Molgula hancocki*, the two latter simple Ascidians. Another *Molgula*, *M. citrina*, Ald. and Han., is a species which has not been heard of for forty years until it was re-discovered at Puffin Island, and re-described by the Local Committee. The following interesting species have been found in the neighbourhood of Port Erin:—*Botryllus aurolineatus*, Giard, *Glossophorum sabulosum*, Giard (not previously known in British seas), *Cynthia morus*, Forb., *Forbesella tesselata*, Forb., and *Polycarpa glomerata*, Ald.

Twenty species in all have been found round the shores of Puffin Island, over forty species round the south end of the Isle of Man, and only four species have been recorded from the Lancashire coast, viz., *Ciona intestinalis*, *Styelopsis grossularia*, *Clavelina lepadiformis*, and *Ascidiella virginea*.

Professor Herdman has written an L.M.B.C. Memoir (No. I.) on *Ascidia*.

Fishes.

A first list of the sea fishes of the district was published by Professor Herdman in 1893, in the Trans. Liverpool Biological Society, Vol. VII., p. 100. In that list 112 species were recorded. Since then additional species have been added, a complete list up to 1896 was included in the report of the Irish Sea Committee, submitted to Section D., at the 1896 meeting of the British Association held in Liverpool.

Last year (1902) Professor Herdman and Mr. R. A. Dawson published a Memoir on "Fishes and Fisheries of the Irish Sea," in which over 140 species are recorded.

Amongst the more recent additions may be mentioned *Carelophus ascanii*, *Blennius gattorugine*, *Raniceps ravinus*, *Calliomymus maculatus* and *Raia fullonica*.

Conclusion.

Since the L.M.B.C. commenced their investigations 18 years ago, they have recorded something like 2,220 species of marine animals as inhabitants of our neighbouring seas. Of these a considerable number had not been previously known as British, and about 80 were unknown to science, and have been described as "new species." The Committee has lately added to its publications a series of anatomical papers, the L.M.B.C. Memoirs on typical British Marine Plants and Animals, of which ten have now been issued.

The work is still in active progress; the fauna is still by no means well known; and even after the first aims of the Committee, which were faunistic and speciographic, have been attained, there are many other points of view—anatomical, physiological, embryological, bionomical, and others—from which even the best known marine forms would well repay further and more detailed investigation. Then again, wider problems, such as the relation between habits and structure, the nature of

specific characteristics, the association of animals together on particular sea bottoms and at particular depths. and other questions of bionomic and oceanographic interest —some of them having important bearings upon geology and upon Fishery questions—are still opening up before our local naturalists and pressing for solution. These are all matters in the investigation of which scientific societies such as those of Southport and Liverpool can play an important part.

In conclusion, it must be a matter of deep regret to all naturalists that the fine and spacious Marine Aquarium for so long an ornament to Southport should, since the British Association last met here in 1883, have ceased to exist. Is it too much to hope that before long the public spirit of Southport may see its way to restore to the townsmen such a desirable and popular educational institution—an aquarium that would be carried on, not as a place of amusement, but on the lines of a local museum where all classes, whether students or amateurs, could intelligently study nature as seen in the living organisms of our Lancashire seas and estuaries?

SEA FISHERIES.

From the above-mentioned memoir on our local sea fisheries we take the following passages, mainly drawn up by Mr. Dawson, as giving some idea of the conditions and industries in our Fisheries District, and a brief account of the constitution and work of the "Lancashire and Western" Sea Fisheries Committee.

All the animals alluded to in the above passages, large or small, bottom-haunting or free swimming, if not themselves fish, and edible, are related directly or indirectly as food or enemies, or competitors in the struggle for existence with the subjects of our commercial fisheries. The various fishes move or migrate about the Irish Sea according to the seasons, the temperature, and the distribution of food. One locality serves as spawning grounds, another as "nurseries" in which the young fish congregate in enormous numbers, and still other

localities serve as feeding grounds at different times of the year. If we omit the more active migratory fish (such as the herring), many of the others of more sedentary habits (such as the flat fishes), probably never leave the Irish Sea throughout their lives. Their spawning grounds are in the deep water round the Isle of Man, their "nurseries" on the Lancashire coast, and their feeding grounds elsewhere over the area, according to the season and the age of the fish.

The banks and channels off the mouth of the Mersey, and the similar areas along the coast by Southport and Blackpool, from the Dee to Morecambe Bay, form one of the most remarkable flat-fish nurseries in the world. It is also, however, a famous shrimping ground, and without at the moment going into the question of how far the one fishing industry is interfering with the prosperity of the other, there can be no doubt of the fact that the operations of the shrimpers at present result in an enormous destruction of young fish. It is a common experience on these grounds at certain times of year to catch thousands of very small fish at each haul, in the proportion of about a thousand young fish for each quart of shrimps taken.

Here are a few hauls which show this remarkable state of affairs:—

Sept. 25, 1893,	off Blackpool,	14,892	small fish	&	3	qts.	shrimps.
Dec. 28, 1893,	,,	,,	20,889	,,	,,	22½	,,	,,
Nov. 2, 1894,	,,	,,	10,810	,,	,,	1¼	,,	,,
Oct. 31, 1895,	,,	,,	12,695	,,	,,	3	,,	,,
Dec. 18, 1895,	,,	,,	19,800	,,	,,	10	,,	,,
Jan. 21, 1896,	,,	,,	18,536	,,	,,	18	,,	,,
Feb. 6, 1901,	,,	,,	13,161	,,	,,	13	,,	,,
Mar. 19, 1901,	,,	,,	5,378	,,	,,	4½	,,	,,
May 20, 1901,	,,	,,	2,430	,,	,,	only a few	,,	

These hauls were taken with the shrimp trawl, and the haul lasted in each case from 40 to 60 minutes. The fish were all edible species of the most important kinds, comprising soles, plaice, dabs, cod, haddock, and whiting. The ground off Blackpool is an area of the territorial water measuring over 3 miles in length, and containing

about 11 square miles, extending from the shore to a depth of five fathoms, which has been closed against trawling for the last ten years. The hauls quoted above, and many others in our statistics, show that young fish congregate there in enormous quantities, and there can be no doubt of the value to the neighbouring fishing grounds of this sanctuary as the habitat of a reserve stock of young fish.

Similar hauls made in the rest of the Lancashire "nursery" grounds, where shrimping takes place freely, such as Heysham to the north, and Burbo Bank, off the Mersey, to the south, show similar results, although the total numbers of young fish taken are not so great. Here are a few samples :—

Heysham,	August	4, 1892—	1,114	small fish,	7	quarts	shrimps.
,,	July	10, 1893—	1,212	,, ,,	3	,,	,,
,,	July	11, 1894—	3,998	,, ,,	4	,,	,,
,,	March	23, 1896—	1,260	,, ,,	½	,,	,,
Burbo Bank,	July	27, 1892—	5,638	,, ,,	2	,,	,,
,, ,,	Sept.	27, 1893—	11,032	,, ,,	32	,,	,,
,, ,,	August	21, 1894—	5,672	,, ,,	15	,,	,,
,, ,,	August	23, 1898—	5,765	,, ,,	13	,,	,,

In the last quoted haul 562 of the young fish were soles. We have reason to think that the number of young soles on the Blackpool closed ground has kept steadily increasing of late years.

Our experimental hauls have shown us over and over again that the shank net is much less destructive to young fish than the shrimp trawl, while catching quite as many shrimps. In comparative hauls that were made on the Blackpool ground on December 28, 1893, the shrimp trawl took 22½ quarts of shrimps and 20,889 undersized fish, while two shank nets took 21½ quarts of shrimps and 8,929 fish, thus saving 11,960 with a loss of only one quart of shrimps. Mr. Dawson has devised a modification of the shank frame, which consists in having the bottom of the net attached to a bar set about three inches above the ground, the result being that as the shrimps spring upwards when disturbed they clear the bar, and so enter the net, while the fish, which

remain at a lower level, escape underneath. In the experiments which have been made on the Lancashire coast, this bar shank net gives good results, but it has not been adopted commercially.

The question has often been raised as to how far the young fishes brought up in the shrimp trawl, if not actually dead, are so seriously injured that they would not recover, even if promptly returned to the sea. We have made many experiments, and kept many records bearing upon this matter. In 1893 we devised a series of "vitality" experiments, which were carried out on the Fisheries' steamer, "John Fell," for several years. Sample fish from the various hauls were placed, after their condition had been recorded, in a large tub, through which there flowed a constant circulation of sea-water. The condition of the fish at stated intervals—half-an-hour, and then hourly—was noted, and the ultimate recovery or death. The result, naturally, depended greatly upon the kind of haul, the length of the drag, the weight of the catch, the muddiness, and other particulars; but it was also found that some fish are much more delicate than others, and can stand less knocking about and pressure. Flat fish on the whole can stand more than round fish. Soles seemed to be specially hardy, about 95 per cent. surviving; while plaice came next, 81 per cent. of those caught, some with the fish and others with the shrimp trawl, having recovered after being in the tub on the average for about an hour. It is obvious then that under ordinary circumstances the majority of such fish caught might still live if returned promptly to the sea. But even if one puts the most favourable interpretation upon such experiments, it is obvious that there is an immense amount of destruction going on in the Lancashire fish "nurseries."

These extensive "nurseries" are an important link in the life-cycle of the more sedentary fish of the Irish Sea. They depend upon the off-shore spawning grounds for their supply, and in their turn they give recruits to the stock of adolescents and adults on the fishing grounds.

Taking the plaice as a typical sedentary flat-fish, and the one to which attention has been largely directed in our district (See the L.M.B.C. Memoir on the Plaice by F. J. Cole and J. Johnstone), we find that the females become mature in our seas at a size of from 13 to 15 inches, and the males at about 11 inches; they are probably at that time about three or four years old. The spawning of the plaice occurs from February to the end of May, and the female fish lays from 300.000 to 400.000 ova. The egg is of relatively large size, as edible fish eggs go, being from 1·6mm. to nearly 3mm. in diameter. The spawning takes place in deep water, 20 to 30 fathoms, at a distance from land, and the egg floats at or near the surface of the sea during its development. At a temperature of 10° C., the embryonic development, from the fertilisation of the egg till the larva is hatched, takes about 12 days; and then there emerges from the egg covering a little plaice larva of about 6·5mm. in length. At first the larva does not eat, and subsists upon the remains of the nourishing matter that was in the egg; but this yolk sac only lasts for about a week, and shortly before it has disappeared the larva begins to feed upon diatoms and minute larval molluses. A fortnight later, three weeks from hatching, it measures about 7·5mm., and now feeds upon larval crustacea. Up to the age of about a month, the little fish is perfectly symmetrical; then that remarkable rotation of the head sets in, which results in both eyes coming to lie upon the coloured side of the animal. The complete metamorphosis takes about two weeks, and the little animal is then about 13mm. in length. The fish, now flattened and coloured like an adult, rests upon the left side, and feeds chiefly upon Copepoda. A somewhat rare Copepod, called *Jonesiella hyana*, which was not known until Mr. I. C. Thompson found and described it from our district, is apparently a favourite food of young plaice at this period, since we frequently find it in their stomachs. When a size larger again, say from 3cm. to 7 or 8cm., the animal feeds upon small worms and upon the feebler crustacea such as *Mysis*. Later on again, and during the

remainder of its life, the plaice feeds mainly on Lamellibranch Molluscs, such as *Mactra* and *Donax*. From the time of its metamorphosis onwards the plaice is a bottom living fish, feeding on the ground, in which it frequently lies partially buried. It has small powers of migration, and in such a district as the Irish Sea, is all its life exposed to man, and liable to be captured. In its early youth it is harried by the shrimpers of all kinds along the shores, and in the estuaries, when it gets a little larger but is still immature, it is still the object of an extensive fishery on the coast, by means of stake nets, and on the in-shore grounds by trawlers; finally in the open sea it is one of the chief sources of revenue to the deep-sea trawler. In this constant liability to be captured, it contrasts markedly with migratory fish, such as the herring and mackerel, and even with fish such as the cod, which at times pass beyond our local fishing operations. Hence the danger of over-fishing leading to a serious decrease of such an important food fish as the plaice in British waters.

Our Lancashire statistics, taken over the last ten years, although in many respects not so continuous and complete as we should desire, give us many valuable items of information in regard to the distribution and abundance of young and old fishes at different seasons. The following extracts as to the plaice, one of our most important flat-fishes, are of interest. They are all from hauls with the shrimp trawl:—

June 21, 1893,	Heysham.....	510	Plaice about	1½	ins.	long.
Aug. 11, 1892,	,,	1,200	,,	,,	2	,,	,,
,, ,,	,,	1,100	,,	,,	2	,,	,,
July 10, 1893,	,,	1,200	,,	,,	3	,,	,,
,, 11, 1894,	,,	3,980	,,	,,	3	,,	,,
Aug. 7, 1894,	,,	3,760	,,	,,	3½	,,	,,
Sept. 27, 1895,	Ulverstone Channel,	1,877	,,	,,	3	,,	,,
Oct. 15, 1895,	,, ,,	9,544	,,	,,	3	,,	,,
Oct. 23, 1894,	Heysham.....	4,000	,,	,,	4	,,	,,
Nov. 9, 1894,	,,	3,000	,,	,,	4	,,	,,
Dec. 4, 1894,	,,	3,000	,,	,,	5	,,	,,

That gives an idea of the range in size of the little fish in the coast "nurseries," where the minute plaice,

which has just completed its metamorphosis, usually appears in May, and from which it gradually moves out into deeper water about the end of autumn. These times are, of course, liable to some variation from year to year, according to the season and state of the weather. Then larger but still immature fish, from 5 to 11 or 12 inches in length, are found a little further out along the banks, such as the one outside the Blackpool grounds, or that outside the Liverpool Bar, in depths of about 10 fathoms. Larger mature specimens are also frequently found in the in-shore grounds in quantity in autumn, as for example, in the sandy bays and in the channels between the banks, where they come to feed; but the first severe frost in winter drives them away. They either burrow more deeply in the sand or move off shore altogether to deeper water. These large fish are then "filling up" with spawn, and at the end of the year, and in January, are found congregating on the spawning banks far out from land. Our chief areas in the Irish Sea where the plaice spawns are midway between Lancashire and the Isle of Man, and to the south and west of the Isle of Man, at depths of from 20 to 40 fathoms. It is on these and other off-shore grounds that the chief fishery for large plaice by the deep-sea trawlers takes place.

The Local Sea-Fisheries Committee.

The object of sea fisheries committees is to protect and improve the sea fisheries, in order that the fish supply to the public may be increased, or at any rate maintained,* and also to protect and assist the means of livelihood of the fishermen.

*To give some idea of the importance of sea fisheries in the food supply of this country, the Board of Trade returns for 1900 show that the value of fish *first landed direct from the fishing grounds*, including shell-fish, was £9,678,000. Of course, by the time it reached the consumer that value would be very much increased.

Before the constitution of sea fisheries committees, fishermen fished when and where they wished, used any kind of net or size of mesh, and captured fish regardless of size or condition. Laws were in force regulating the

taking of oysters, game, and salmon, but none to prevent the immense destruction of immature and undersized sea-fish which was daily taking place, or to prevent the use of instruments and methods of fishing which, in time, might destroy the fisheries.

Amongst the first to call for legislation were the fishermen of Lancashire, and the first Sea Fishery Committee to be constituted was that of Lancashire. The prime mover in effecting this was Mr. John Fell, of Ulverston, the present Chairman of the Lancashire and Western Sea Fisheries Committee, who, prior to the recent amalgamation, had been Chairman of the Lancashire Sea Fisheries Committee from its foundation.

The powers given to sea fisheries committees are chiefly :—

For restricting or prohibiting, either absolutely or subject to such regulations as may be provided by the bye-laws, any method of fishing for sea-fish, or the use of any instrument of fishing for sea-fish.

For determining the size of mesh, form, and dimensions of any instrument of fishing for sea-fish.

For prohibiting or regulating the deposit or discharge of any solid or liquid substance detrimental to sea-fish or sea-fishing.

For fixing the size and condition at which shell-fish, crabs, and lobsters may not be removed from a fishery.

For the protection of shell-fish laid down for breeding purposes.

For requiring the re-deposit in specified localities of any shell-fish, the removal of which is prohibited by, or in pursuance of, any Act of Parliament.

The bye-laws made by Sea Fisheries Committees are subject to confirmation by the Board of Trade, and their operation is confined to sea fisheries districts, which are

limited to that part of the sea within which his Majesty's subjects have by international law the exclusive right of fishing, and which is locally known as the territorial waters within the three mile limit. This does not, however, necessarily mean only three miles from the coast in all cases, as the distance is measured from low-water mark of the dependant islands and banks; and as regards bays, the distance of three miles is measured from a straight line drawn across the bay in the part nearest the entrance, where the width does not exceed ten miles; and the miles mentioned are geographical miles, whereof sixty make a degree of latitude.

Before drafting the first code of bye-laws, the Committee held public inquiries at the principal fishing centres in the district, and took the views of the fishermen, and upon these views the bye-laws were based. From time to time alterations have been made, or additional bye-laws drafted; but it has always been the practice of the Committee to first ascertain the views of the fishermen, and when objections to bye-laws have been made, the Board of Trade has held inquiries into the objections before confirmation. In all, six public inquiries have been held during the last ten years by the Board of Trade with regard to the bye-laws of this district.

Briefly the Bye-laws now in force enact:—That only nets which have meshes which will allow of the escape of small fish may be used. A certain area off Blackpool is closed against the use of seine, draft, trawl, bow, hand, hose, shank, stake, or otter nets. The size of crabs, lobsters, mussels, cockles, oysters, allowed to be removed from a fishery is regulated. No berried lobster or berried edible crab may be taken. The forms and sizes of nets and other instruments are regulated, also the method of using them, and the places and times where they may be used. A close time for mussels and sparling is enforced. And finally, steam trawling within the district is forbidden.

Although, as previously mentioned, the fishermen

asked for legislation, a number of them have not thought fit to observe the regulations, and unfortunately it has been found necessary to institute a large number of prosecutions, the number up to the end of 1901 amounting to 770. The Committee, recognising the fact that for many years no regulations relating to the capture of sea fish have been enforced, have seldom asked for heavy penalties, and the fines imposed have in most cases been small. This may perhaps account for the large number of offences against the bye-laws. The number of cases, however, in which proceedings have been taken do not, we are afraid, by any means represent the number of infringements of the byelaws.

The original Lancashire district included the fisheries in territorial waters, lying off the coast from Cumberland to Hilbre Island in Cheshire. In 1894 the district was extended to Rhos Point, the western extremity of Denbighshire, which was the northern boundary of the Western Sea Fisheries District.

Since the amalgamation last year (1900) the Committee has been enlarged, and the number of members is now as follows:—

Representatives of the following counties—Lancashire 8, Cheshire 2, Flintshire 1, Denbighshire 1, Carnarvonshire 2, Anglesey 2, Merionethshire 2, and Cardiganshire 2.

Liverpool and Manchester have each two representatives, and the following boroughs each one:—Barrow, Birkenhead, Blackburn, Bootle, Bolton, Burnley, Bury, Chester, Oldham, Preston, Rochdale, St. Helens, Salford, Stockport, Wigan, and Southport.

The following Boards of Conservators of Salmon Districts have each one representative:—Kent, Lune, Ribble, Dee, Elwy and Clwyd, Conway, Seiont, Dwyfach, Dovey, Ayron and Teify.

Finally, 29 members are appointed by the Board of Trade, making a Committee of eighty in all.

The present joint district extends from a line drawn true south-west from Haverigg Point, in Cumberland, round the sea coasts of Lancashire, Cheshire, Flintshire, Denbighshire, Carnarvonshire, Anglesey, Merionethshire, and Cardiganshire, to a line drawn true north-west from Kemmaes Head, in the County of Pembroke—a coast line of 383 nautical miles, or 441 statute miles: that is, measuring round the larger bays, and some of the estuaries, but not up the rivers, nor Barrow Channel, nor the Menai Straits from Beaumaris to Carnarvon. The area, including the channels and rivers, out to the three mile limit, is 1,300 square nautical miles, or 1,498 square statute miles.

The number of fishing boats and fishermen fishing from the ports in the Lancashire and Western Sea Fishery District is as follows:—48 steam trawlers, 98 first-class sailing trawlers, 532 second-class sailing trawlers, prawn boats, and shrimping boats, 470 third-class boats. The number of fishermen who fish from boats is 2,841, and of shore fishermen 746. The shore fishermen include cart and push-net shrimpers, shellfish gatherers, stake-net fishermen, crab, lobster, and shore-net fishermen. The above list does not include boys, girls, and older persons employed in shrimp-picking, nor any persons employed in connection with the fishing industry ashore, of which there is a large number, nor are the trawlers or other vessels included which come from a distance, as for instance, the Brixham trawlers now fishing in Cardigan Bay.

Nearly every description of sea-fishing is carried on within this district, including fish trawling, line fishing in all its branches, drift-net, trammel-net, and draw-net fishing, set-nets and stake-nets in many different forms are also used; weirs and hedge baulks are found in places. The principal fish taken within the limits are soles, plaice, dabs, flounder, skate, cod, salmon, herring, a few eels and sparling, and occasionally mackerel.

Besides the above, there is a very large shrimping industry, which is carried on by the use of shrimp trawls,

shrimp shank nets, hose nets, and push nets. Lobsters, crabs, and prawns are taken in many localities, and there is a very large area of shell-fish beds—mussels, cockles, and oysters.

Twenty-three salmon rivers flow into the district, but the work of the Sea Fisheries Committee in no way interferes or clashes with the work of Salmon Boards, the only connection between the two being that in cases where the Sea Fisheries District overlaps that under the jurisdiction of a Salmon Board, the Fisheries officers hold appointments as salmon bailiffs, and in their ordinary course of duty assist the Salmon Boards by reporting to them any offences against the salmon bye-laws that come under their notice. This has been found of material advantage in the preservation of salmon, especially in the estuaries, and has done much to put a stop to the taking of salmon by the use of stake nets.

The administrative staff of the Sea Fisheries District consists of a Superintendent (Mr. R. A. Dawson), 12 fisheries officers, and the crew of the steamer, which is composed of a captain and 10 men. In addition to these there are at present seven assistant fishery officers, who receive a small annual retaining fee. Some of the salmon bailiffs and a few others also hold certificates as honorary fishery officers. The scientific department consists of an honorary director of scientific work, Professor W. A. Herdman, F.R.S., and two scientific assistants, Mr. Andrew Scott, A.L.S., who has charge of the Sea Fishery Hatchery and Marine Laboratory at Peel, and Mr. James Johnstone, B.Sc., at the Sea Fisheries Laboratory in University College, Liverpool.

The district is split up into four divisions. The first extends from Haverigg Point, in Cumberland, to the river Ribble; the second from the river Ribble to Rhos Point, in Colwyn Bay; the third from Rhos Point round Anglesey to the south-western extremity of Carnarvonshire; and the fourth from the south-western extremity of Carnarvonshire to Kemmaes Head, in Pembrokeshire. These divisions include, besides the

territorial sea area, a large portion of the rivers, bays, channels, and straits found along the coast.

In each of the divisions there are stationed three fishery officers (one head fishery officer and two under ones), with a sailing cutter and a boarding boat. Their primary duties are to enforce the bye-laws within their particular divisions, but they are also required to do duty on the steamer, or in other divisions, when called upon by the superintendent. In order to carry out their work they cruise about on the fishing grounds, boarding the different vessels at sea and in harbour, in order to measure the nets in use. They have frequently to visit the shell-fish beds, examining the fish taken, and the instruments; also to examine the stake nets set along the coast. In cases where infringements of the bye-laws are observed the illegal nets or instruments are seized. Another part of the fishery officers' duty is to make hauls on the fishing grounds with different kinds of fish and shrimp nets, for the purpose of assisting in the observations which are being made in order to discover what size of fish different-sized meshes will take, and where the young fish congregate. They also collect samples, specimens and tow-nettings for the work of the scientific department. These samples are sent to be investigated in the laboratories. The fishery officers have to keep diaries of work done, fill up forms of results of hauls, make reports of the results of the different fisheries within their divisions, report offences against the bye-laws, and attend and give evidence in cases of prosecutions.

The work done by the steamer is similar to that done by the fishery officers on their sailing cutters, with the addition of surprise visits, which have to be made to the fishing grounds in all parts of the district. With so long a coast line, this entails a great amount of steaming, and owing to the wild nature of some parts of the coast, is at times dangerous work. The observations taken from the steamer as to results of hauls with different nets, and various meshes, are also on a larger scale—the off-shore

grounds, Cardigan Bay, and other distant fishing grounds being frequently visited for this purpose. As an example of the experimental and observational work carried on by the steamer, we give here the results of a series of experimental hauls, which we made in 1894, with a trawl provided with two nets, a finer outside a coarser, so as to show how undersized sea-fish can be saved by the use of a larger size of mesh, which allows of their escape. In these trials a trawl-net of 7-inch mesh was used. This had a second net outside, of $4\frac{1}{2}$-inch mesh, laced round the cod-end in such a manner that no fish could enter the outer finer net without having first passed through the meshes of the trawl-net of 7-inch mesh.

First Haul—Queen's Channel, Mersey, August 23rd, 1894.

In net of 7-in. mesh.	1 sole 580 plaice 73 dabs 29 small ray 683	Net down one hour.
In net of $4\frac{1}{2}$-in. mesh.	2437 plaice 1976 dabs 4413	These fishes passed through the meshes of the net of 7-in. mesh, and were detained in the net of $4\frac{1}{2}$-in. mesh, and were all undersized.

The result of this haul shows that under ordinary circumstances in this one short drag 4,413 small fish would have escaped through the meshes of a trawl-net of 7-inch mesh, but would have been retained in a trawl-net of $4\frac{1}{2}$-inch mesh.

SECOND HAUL—Bog-hole, Southport, June 29th, 1894:—

In net of 7-in. mesh.	397	place	Net down one hour.
	100	dabs	
	16	flounders	
	1	skate	
	514		

In net of $4\frac{1}{2}$-in. mesh.	4710	plaice	Of these fish, which passed through the meshes of trawl net having 7-in. mesh, and were retained in net of $4\frac{1}{2}$-in. mesh, all were undersized, in fact, none of them were $\frac{1}{4}$ lb. in weight.
	2515	dabs	
	35	young ray	
	7260		

Again we see the great saving of young fish life by use of a larger size of mesh. A number of independent witnesses were present when the haul was made.

THIRD HAUL.—Bog-hole, Southport, July 26th, 1894:—

In net of 7-in. mesh.	337	plaice	Net down one hour thirty minutes.
	248	dabs	
	7	flounders	
	5	gurnet	
	4	ray	
	2	whiting	
	603		

In net of $4\frac{1}{2}$-in. mesh.	1197	plaice	All undersized.
	1771	dabs	
	21	gurnet	
	14	whiting	
	7	small ray	
	3010		

In this haul we have 3,010 small food fishes riddled out of the net of larger mesh.

Fourth Haul—Horse Channel, Mersey, August 9th, 1894.

In net of 7-in. mesh.	158	plaice	Net down one hour thirty minutes.
	25	dabs	
	1	flounder	
	1	skate	
	3	ray	
	188		

In net of $4\frac{1}{2}$-in. mesh.	976	plaice	All small.
	355	dabs	
	6	gurnet	
	2	whiting	
	1339		

Here we have 1,339 undersized fish passing through the net of larger mesh, which, under ordinary circumstances, would have escaped. Members of the Liverpool City Council and Lancashire Sea Fisheries Committee witnessed this haul.

FIFTH HAUL—July 19th, 1894. Net down one hour thirty minutes :—

In net of 7-in. mesh.	23	soles	Size from 8 to 14½ inches.
	131	plaice	
	19	dabs	
	1	skate	
	174		
In net of 4½-in. mesh.	6	soles	All small, from 4 to 8 inches.
	610	plaice	
	323	dabs	
	4	gurnets	
	87	young ray	
	1	whiting	
	1031		

This haul shows a saving of 1,031 young fish by the use of the larger mesh.

Many other similar experimental drags with the trawl confirm the above results. In all the trials a trawl beam of only 25 feet in length was used. When the large number of boats employed in trawling is considered, and it is remembered that in the day each of these makes several hauls of much longer duration than those made in our trials, it must bring home the fact that enormous quantities of under-sized fish might be saved by the use of a larger mesh. Such use of a larger size of mesh would in all probability be one of the first effects of any legislation prohibiting the sale of fish under certain specified sizes.

A large number of experimental and observational or statistical hauls of this nature have been made from the steamer, under Mr. Dawson's direction, and many hundreds of sheets of such records have been accumulated; but we are convinced that, in order to

carry out such work adequately and satisfactorily, a special steamer for scientific and statistical work should be employed in our area of the Irish Sea.

Southport Shrimping.

Shrimping, once the staple industry of the place, is still of considerable importance. There are now seventy boats fishing on our coasts, all hailing from Southport and Marshside, and the whole of this fleet of boats is engaged in the shrimping industry at some time of the year. They are said to form the finest fleet of half decked fishing boats in the United Kingdom, and most of them have been built during the last six years. The catching power of the fleet of boats is now ten times as great as it was 25 years ago. Each boat is worked by two men, and its takings divided into five shares. The two men each take two shares, and the boat takes one share. Each fisherman finds one net and the boat finds two nets when engaged in shrimping. The average taking during the last twelve months, ending December 31st, 1902, has been thirty quarts per boat each fishing day. There are about 200 fishermen in Southport or Marshside all more or less engaged in shrimping. The shrimp-potting is also an important industry, and provides a fair amount of work in picking and potting the shrimps. There are about thirty shrimp potters in Southport and they take nearly all the shrimps that are caught on our coast and distribute them to nearly every town in Great Britain. The fishermen's wives and children boil and pick the shrimps ready for the potters to prepare for the market, and during the last fifteen years this shrimp potting industry has increased tenfold. The boat building, net making, butter manufacturers, printers, pot manufacturers, and railway companies all share more or less in the profit derived from the Southport shrimp industry.

Explanation of Plan and Sections.

The Plan shows the disposition of deep and shallow water in the wider northern part of the Irish Sea which faces Lancashire. The contrast between the shallow area to the east of the Isle of Man, and the deeper channel to the west is obvious, and is also seen in the sections across the region.

In the sections the vertical scale is 88 times the horizontal—ten fathoms in depth being equivalent to one mile in distance. The land contour is not given.

Section I. is taken along the line A—B, from Dundrum Bay in Ireland, to Morecambe Bay in Lancashire, through Douglas and Barrow. The depths are in fathoms.

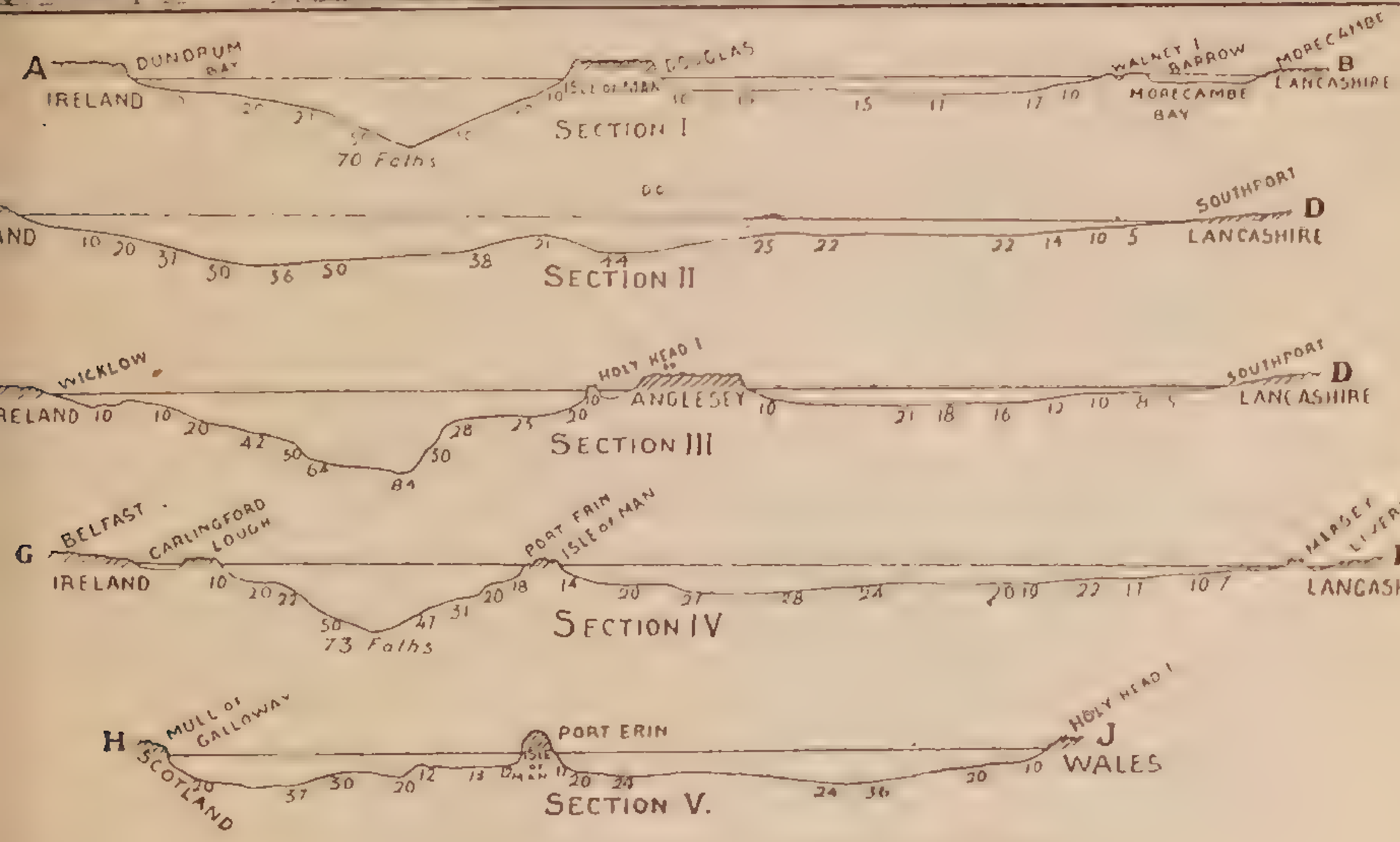
Section II. is taken due west from Southport along the line C—D. The dotted line Do. indicates the longitude of Douglas as the central point in Sections II., III., and in Section II. the elevation marked 21 shows the southerly extension of the plateau on which the Isle of Man lies.

Section III is taken along the line D—E, west-south-west, from Southport to Wicklow through Anglesey and Holyhead Island. It cuts through the deepest part of the channel (over 80 fathoms), and shows the remarkable declivity on the eastern side in going from Holyhead to Ireland.

Section IV. runs along the line F—G, nearly north-west from Liverpool through Port Erin in the Isle of Man, to Carlingford Lough and Belfast It shows the estuary of the Mersey and the shallow waters of Liverpool Bay, important as shrimping grounds and flat fish "nurseries," while further out it passes through the off shore fishing grounds and spawning areas at over twenty fathoms. Between the Isle of Man and Ireland it cuts through the deep channel at about 73 fathoms.

Section V. runs north and south along the line H—J, from the Mull of Galloway to Holyhead through Port Erin. It does not cut the deep channel of over fifty fathoms in any part; but lies almost wholly in these moderate depths of twenty to forty fathoms which yield the most abundant and varied fauna to the marine biologist.





H PLAN AND SECTIONS—NORTH IRISH SEA.

A NOTE ON THE VERTEBRATE FAUNA FOUND IN THE DISTRICT.

The Vertebrata of the Southport District are for the most part only represented by the common British species. This is largely due to the fact that this portion of Lancashire contains no mountains or moorlands, and that the only uncultivated land consists of the sandhills fringing the coast.

Amphibia.

The common Frog *Rana temporaria*, and the Toad, *Bufo vulgaris*, both occur. The distinctly local Natterjack Toad, *Bufo calamita*, occurs in the slacks in the sandhills in considerable abundance. This species is smaller than the common toad, from which it can be distinguished by the light line down the centre of the back; the hind toes are not deeply webbed, and the hing leg is short. Since the recent drainage of the slacks this toad is becoming rare.

The common Smooth Newt, *Molge vulgaris*, and the Great Water Newt or Warty Newt, *Molge cristata* also occur, but with much less frequency than formerly from the same cause.

Reptilia.

The Viper or Adder, *Vipera berus*, and the Ring or Grass Snake, *Tropidonatus natrix*, although occurring sparingly in south-west Lancashire, probably do not occur in the immediate neighbourhood of Southport, the very few reported specimens being no doubt imported. All the three British Lizards occur. The common Slow Worm, or Blind Worm, *Anguis fragilis*, is found occasionally in the Leyland district. The common

Viviparous Lizard, *Lacerta vivipara*, occurs sparingly on the mosses and rarely on the sandhills. The Sand Lizard, *Lacerta agilis*, which only occurs in Dorset, Hants, and Surrey, in addition to this district, until recently was to be found in great numbers on the sandhills. It is now, however, becoming comparatively rare, owing to the advance of civilization.

Aves.

The birds of the district have been carefully studied for a long period by many observers, among whom may be mentioned the late Mr. Graves and the late Mr. Tyrer; owing to its position the district lends itself to "casuals," and it is frequently difficult, in the case of the rarer species, to distinguish them from the regular inhabitants or migrants. None of the true falcons breed in this district, although the kestrel, *Falco tinnunculus*, was formerly fairly abundant on the sandhills. The barn and tawny owls are fairly common. The short eared owl, *Strix brachyotus*, occurs on the mosses, one of the few localities in Lancashire in which it breeds. The bittern, *Botaurus stellaris*, although formerly occurring with comparative frequency is probably now extinct in this district. The heron, *Ardea cinerea*, breeds in several localities in the neighbourhood, and may frequently be seen on the mosses.

Owing to the large gardens surrounding so many of the houses of Southport and Birkdale there is a continually increasing number of the commoner singing birds, such as the thrush, *Turdus musicus*, and the blackbird, *Turdus merula*. The skylark, *Alauda arvensis*, occurs in very great numbers in the surrounding districts, both on the sandhills and on the mosses. Both the butcher birds, *Lanius excubitor* and *L. collurio*, formerly occurred in the sandhills but are now probably extinct.

The golden plover, *Charadrius pluvialis*, and the ring plover, *C. hiaticula*, although formerly common in the sandhills between Birkdale and Ainsdale, are now very

rare. The roseate tern, *Sterna dougallii*, and the sea-swallow, *S. hirundo*, may frequently be seen along the shore. They breed in the sandhills between Ainsdale and Formby. Of the gulls most of the British species occur, even the somewhat rare arctic gull, *Larus parasiticus*, being an occasional visitor. An interesting spectacle may be witnessed daily during the winter months at the Pier Head. For many years it has been the practice to feed the gulls with the refuse of the fish market at mid-day. Great numbers of gulls naturally collect each day, and it is probably owing partly to this practice that Southport can boast an exceptional number of gulls for a coast which, not being rock bound, offers no facilities for breeding.

Mammalia.

With regard to this group there is little to be said, as it is represented in this district only by common species, such as are ubiquitous throughout the British Isles. Even the common otter appears to be wholly extinct.



FEEDING THE SEAGULLS AT SOUTHPORT

MARTIN MERE AND ITS ANTI-QUITIES.

By Harold Brodrick, M.A.

INLAND of Southport there were until comparatively recently a series of lakes resulting from defective drainage. These lakes, although of no great depth, were at any rate of sufficient importance to give this portion of Lancashire the title "Linuis," or the Lake District. Of these lakes the largest was Martin Mere, which lay between Crossens and Rufford.

The others were Barton Mere, near Halsall, Gettern Mere, Black Otter and White Otter, near Ainsdale, and the Church Lake, near Freshfield.

These smaller lakes have ceased to exist, mainly owing to the growth of aquatic plants, sphagnum, and reeds, although artificial drainage has also helped.

Martin Mere, on the other hand, would at once revert to its condition as a lake if pumping operations on a very extensive scale were not resorted to.

Martin Mere was formed by the outlet of the old river at Crossens being stopped by tidal alluvium. The forest which existed over the bed of the mere was flooded, thus causing the death of the trees, a lake taking the place of the forest. This lake would be very shallow, in no place of a greater depth than twenty feet, and its shore line would vary considerably with the amount of rainfall. From various considerations it is probable that this lake was formed during the period between the Roman occupation of Britain and the Norman Conquest. The earliest extant map is one in the Harleian manuscripts,

dated 1598, and from that time down to 1745 all the maps published give more or less the same outline to the lake. Leland, writing a few years after the former date, speaks of the mere as being four miles long and two miles wide, a statement which would fairly tally with the map. All these early maps show the outflow of the mere running into the Douglas near Rufford, although Camden, writing in 1586, states that the mere discharged itself at a mouth of its own into the estuary of the Ribble. From a consideration of the levels of the ground it seems probable that in times of ordinary rainfall the mere flowed into the Douglas, but that in times of flood the Douglas overflowed into the mere, which was then forced to discharge at Crossens. Blome, writing in 1673, says that the mere flowed one way into the sea and the other way into the Douglas.

All the maps show three islands in the mere, of which only one has so far been identified, the rising clay ground at Berry House, on which stands the old windmill, a well-known landmark. The highest point of this island would never be more than five feet above the highest waters of the mere, but the foundations of an earlier windmill close by point to its having been a comparatively important place. This island was probably about a quarter of a mile long by two hundred yards wide.

The boundaries of the north and east sides of the lake were well defined, being the rising ground from Rufford to Holmes Wood and Mere Brow.

The western end of the lake would be exceedingly swampy, and its shore would vary considerably with the rainfall. The level of the mere seems to have been only between nine and eleven feet above ordnance datum.

In the year 1692, Thomas Fleetwood, of Bank Hall, near Tarleton Bridge, obtained from the landowners of the district a lease of Martin Mere for a period of three lives and thirty-one years, and also obtained an Act of Parliament granting him powers to drain the district.

He cut through the banked alluvium near Crossens, making a canal or sluice 24 feet wide and about a mile and a half long, with a pair of lockgates at the seaward end. This drainage system was only successful for a short time, as the drifting sand soon choked the gates and rendered the works to a considerable extent abortive. Mr. Fleetwood died in 1717, and was buried in North Meols Church, where his monument, with a Latin inscription, may still be seen. Owing partly to an excessively high tide, which washed away the flood gates and destroyed the training walls, the mere by the year 1760 had almost reverted to its ancient conditions, and was practically valueless. In the year 1778 Thomas Eccleston, an ancestor of the present Scarisbrick family, settled at Scarisbrick Hall, and as a great portion of the mere lay on his estate he determined to attempt its better drainage. By the advice of Mr. Gilbert, of Worsley, the engineer of the Duke of Bridgewater's canal, he erected three sets of gates, after obtaining leases of the land from the other landowners. The device worked fairly satisfactorily, with the result that a large portion of the mere became valuable for agricultural purposes. For this public service Mr. Eccleston was presented with the Gold Medal of the Society of Arts, Manufactures and Commerce.

During the years following, however, several disasters happened to the district. The Leeds and Liverpool canal and the river Douglas burst their banks, and the sea, encroaching between Crossens and Hesketh Bank, twice broke into the low-lying lands, with the result that the landowners became disinclined to spend much money in keeping the sluice open.

In the year 1849 Sir Thomas Dalrymple Hesketh, of Rufford, commenced the method of draining the mere which is in use at the present day, and which is very efficient.

His land lay between Berry House island and Rufford, a portion of the mere which had the lowest level, and which, therefore, flooded most easily. He built a dam

across the sluice at the point where it cut Wigans-lane, and by the use of a steam pumping engine raised the water out of the sluice which ran through his land. From this higher level the water ran naturally down to the sea, and by this method some 800 acres were effectually drained.

A similar system has been adopted by the Scarisbrick Trustees, who erected at a cost of £60,000 the Crossens pumping station, which now contains three steam pumps. The pump usually in action is capable of raising 17,000 gallons of water per minute; one of the others is capable of raising much more, but is only used in times of exceptional flood. By the use of these methods the old lake has almost completely vanished, and it is only very rarely, after a continued period of wet weather, that a considerable quantity of water stands for any length of time.

A further scheme is now under consideration by the landowners of the district for its still better drainage.

A considerable number of prehistoric remains have been discovered in and about the old mere. Records exist of the finding of no less than eleven canoes, only one of which has, however, been preserved. This canoe was discovered in 1899, and dug out by a farmer, being mistaken at first for a tree stump which impeded his ploughing, and is now to be seen in the Cambridge Hall. It seems to have been larger than the majority, but a description of it will serve for all of them.

This canoe rested in the peat just above a deposit of beech or hazel leaves and branches, part of the growth which is to be found all over the bed of the mere at a depth of about five feet.

The greater portion of the canoe, which was hollowed out of the trunk of a giant tree, was perfect, only the bow being broken by the impact of the plough which caused its discovery. The keel of the boat was about 3 feet below the surface, the bow lying slightly higher and pointing away from Marley Brow.

The length of the canoe is 16 feet 6 inches, and the greatest width 4 feet, both outside measurements, while the thickness of the sides is about 2 inches. The adze marks, which seem to be those of a sharp steel implement, are clearly to be seen, both inside and outside. There are three ribs, each about 3 inches square, fastened to the sides of the canoe with wooden pegs, while near the centre is a flat board 1 foot 3 inches long, and 8 inches wide, which seem to be part of a seat. In the gunwale, rather nearer the bow than the centre, on the one side are two holes, which contained thole pins 6



H Hillman. *Photo.*

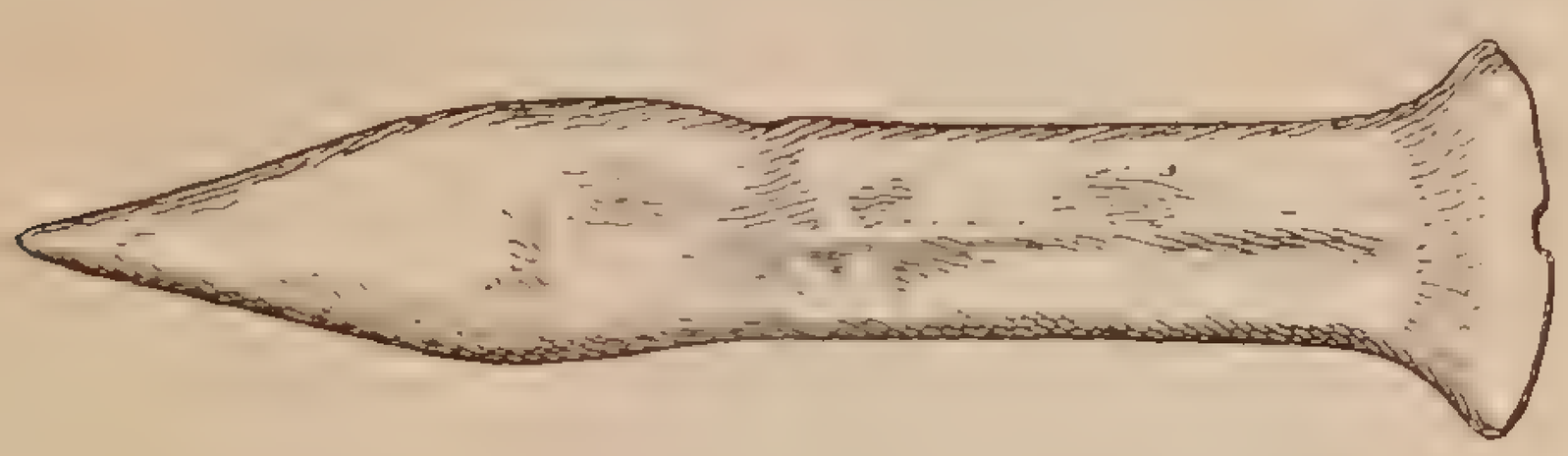
CANOE FROM BED OF MARTIN MERE.

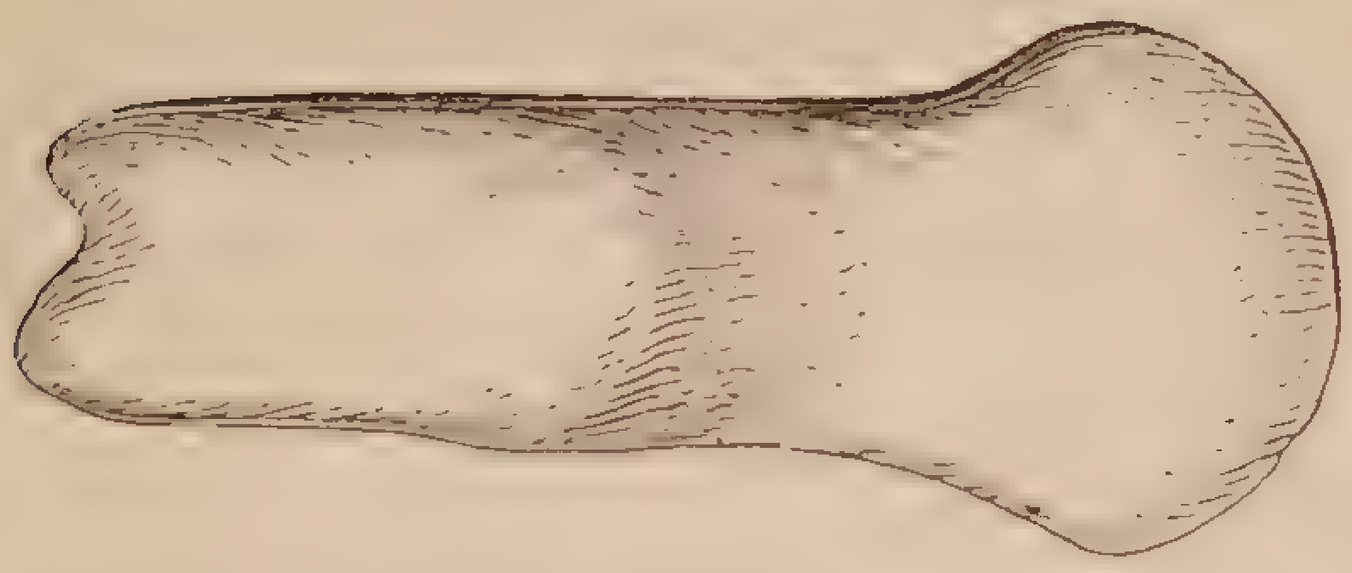
inches long; the opposite side of the boat was unfortunately broken away at that point. The bottom of the canoe is flat, with no keel, and practically no shaped stern. The sides simply thicken out behind, the stern being very solid, about 7 inches thick at the top, and more below. The stern had split at some time, and a piece of wood had been let into the top over the crack, and fastened in with wooden pins. On the inside of the stern, and covering the crack, a sheet of lead had been nailed with iron nails, which had rusted away. This sheet of lead is about as thick as a sixpence, 1 foot 2 inches long, by 6 inches wide, the length extending in

the direction of the length of the boat. Inside the bows, also covering a slight crack is another strip of lead 1 foot 6 inches by 7 inches. Both these cracks seem to be above the water line, so that the lead sheets would only be useful in case the canoe rolled or if there were waves.

A silver sixpence, dated 1688, was found about the same time near this canoe. This had most likely been dropped by some of the people interested in Mr. Fleetwood's drainage scheme, which was begun a few years after the date of the coin.

Charles Leigh, writing in 1700, speaks of a stone like a whetstone found near the mere. He gives an





BRONZES FROM MARTIN MERE—HALF NATURAL SIZE.

engraving of it, from which it is clear that it was simply a stone axe. He also gives an engraving of what he calls a copper axe. This undoubtedly would be a bronze axe head. Unfortunately, no scale is given, and as on the same page he gives an engraving of a canoe the same size it is impossible to guess their dimensions. He rather quaintly goes on to prove the universal deluge from the occurrence of these implements.

In February, 1899, either in the bed of the mere or close to it, unfortunately it is not known where, or by

whom, two bronzes and a Roman coin were found. It is said that other coins have been found close at hand, and that therefore the finders are keeping the place secret. One bronze, five ounces in weight, and five inches in length, is a very well-made spear head, with even now a sharp cutting edge; the butt end is deeply grooved for nearly half its length, as if to be held by a split stick and then bound in. The other bronze is ten ounces in weight and four inches long, but of a much rougher make; it also seems to have been a spear head, the cutting edge is very blunt, and the groove for the shaft not nearly so deep. This bronze seems to be of earlier date than the former, and made of different metal, as it is much more oxidised. The coin, which is also bronze, is of the reign of Vespasian, and bears on the obverse a man's head facing right, surrounded by the words IMP. CÆSAR, VESPASIAN AUG., and on the reverse a square unornamented altar, with the letter S on one side and the letter C on the other, while underneath is the word PROVID. The coin is considerably worn. These last three antiquities are now in the possession of Mr. Henry Taylor, F.S.A., of Birkdale.

ARCHÆOLOGY.

By Willis Brunt.

THE area included in this general survey of the Archaeology of the district round Southport is practically that known in the time of William the Conqueror as "inter Ripam et Mersham"—*i.e.*, between the Ribble and the Mersey. It comprises nearly the whole of the Hundreds of West Derby and Leyland, and a small portion of the Hundred of Blackburn.

It is bounded on the north by the estuary of the Ribble and on the south by that of the Mersey, on the east by the railway line from Warrington through Wigan to Preston and on the west by the Irish Sea.

To one whose acquaintance with the district is slight, it might seem that very little could be said of it from an archaeological point of view, but the more it is studied the richer we find its lore.

Pre-historic.

When Neolithic man, migrating from the far east, first made his appearance here no one can tell, but that he had a home here cannot be doubted, for his flint flakes, arrow heads, and scrapers have been found in many parts of the district. Six or seven years ago an "anvil stone" was found at Appley Bridge, showing that flints were worked there, and it is remarkable how frequently broken flints have been found around the edge of Martin Mere, not merely on the boulder clay, but in the peat itself. Polished celts have been found here and there, as well as evidences of advancing civilisation in the form of bronze spear heads and other implements.

The earliest known map of the country is that of Ptolemy, whose outline of this coast has given rise to much discussion, inasmuch as he makes one estuary serve for both the Mersey and the Dee. There are geological indications in support of the accuracy of his survey on this point which we need not stop to discuss now. To the north of the Dee estuary the next opening of any consequence is named Belisama (or Belisanna), which answers to the mouth of the Ribble. Without going into any detail of the changes which have been brought about, it may be stated that our present ten fathom line coincides pretty nearly with the coast line as shown in Ptolemy's map. Dense forests existed from Penwortham to the Dee, extending inland in a line with Longton, Rufford, and Ormskirk. Roots and trunks of ancient trees are frequently met with in the boggy lands of the district, and there are still traces to be seen of a submerged forest near the mouth of the river Alt. Many years ago an old village, known as Altmouth, disappeared entirely through the encroachments of the sea; Walden Thorpe, a village near what is now St. Anne's, and other portions of the coast north and south have disappeared through the same agency. Nowadays the reverse process is going on, for owing to the accretions of sand the coast line is moving seawards.

This part of the country was really a lake district. Even within comparatively recent times there were three small lakes near Ainsdale, known as White Otter, Black Otter, and Gettern Mere, while north-east of Southport there was a shallow lake, Martin Mere, with a surface area nearly as large as that of Windermere. Leland, writing between 1535 and 1542, says of it, "Martin Meare towarde Latham is the greatest meare in Lancastreshire, four miles in lengthe and three in bredthe." Drainage operations during the last two hundred years have caused these lakes to disappear, and their sites are now occupied by well-cultivated land.

Whether the earlier settlers built on piles, as did their fellows in Switzerland and other places, or whether they

simply pitched their huts on the banks of this mere we cannot say, though future excavations in the bed of the lake will probably settle this point. Boats, at any rate, were brought into use by the earlier inhabitants, these being generally hollowed out of the trunk of a single tree. At one time they must have formed quite a fleet, for when the lake was first drained eight canoes were found. Since then others have been discovered, until the total has been brought up to fifteen, and the last one, unearthed at Crossens in 1899, is now to be seen in the Cambridge Hall, Southport.

(NOTE.—See article on Martin Mere by Mr. Brodrick for further information on this subject).

ROMAN.

The Roman invasion had comparatively little effect upon this part of the country, probably owing to its being off their regular line of roads and not offering sufficient temptation. The main road from London to Carlisle ran through Warrington, Wigan, and Preston, camps being formed at both Warrington and Preston (Walton). There was probably a minor road running from Wigan to Formby, but this has not been clearly traced. Several coins of the early centuries have been found near Freshfield, but with these exceptions Roman remains are very scarce. The well-known Roman station at Ribchester is situated on the north bank of the Ribble, eight miles east of Preston.

PRE-NORMAN.

After the departure of the Romans early in the fifth century England became the happy hunting ground for successive generations of the Vikings and similar marauders. From North Germany, Denmark, Scandinavia, and other parts of the continent they came sailing along our coasts, making raids on the villages whenever opportunity offered. In this district they sailed up the rivers Alt and Douglas, gathered what plunder they could, and then retired to their ships. Growing bolder

and stronger they took possession of as much land as they could colonise, their tenure at first being very precarious. The race generally termed Saxon was the first to make permanent settlement here, but its power was subsequently challenged by the Danes, under which term may also be classed the raiders or settlers from Norway and Sweden, who for a short time gained the upper hand. They appear to have first wintered in this county about 840, and the names of their settlements are still with us in Formby, Crosby, West Derby, Ormskirk, Birkdale, and others.

The sculptured crosses at Heysham, Halton, Lancaster, and Whalley are well known, but in this district the only example to be found is at Winwick near Warrington. This, unfortunately, is not complete, only the portion forming the central boss and the two arms remain, but as this measures five feet the cross must have been ten or twelve feet in height, and thus would be the largest cross in the county. The stone was dug up in the churchyard by a gravedigger in 1843, and was put in its present position (wrong way up) on two short pillars close to the east wall of the chancel. (Mr. Henry Taylor on the Ancient Crosses of the Hundred of West Derby, Lanc. and Ches. Ant. Soc., Vol. XIX.)

At one end is a rude carving representing the dismemberment of St. Oswald. This saint was king of Northumbria, and had his home at Maserfelthe, or Marsefelt, near Winwick. Tradition (quoted by William Blundell, as appears in the "Crosby Records") has it that the king being grievously wounded in a battle with one of his pagan enemies vowed that if he might "wende quicke," that is, win wick or life again, he would build a church there, hence the name Winwick. Close by was St. Oswald's well, which for generations was a great place of pilgrimage, in fact the figure at one end of the cross of a man carrying two buckets appears to have some connection with this holy well. The saint's head and right arm were first buried at Lindisfarne, then the head was re-buried in St. Cuthbert's grave at Durham,

and the right arm removed to Bamborough, while the left arm was taken to Worcester; the body first found sepulchre at Bardney and then at Worcester. These relics had so high a repute for working miracles that a second head and a third arm were afterwards provided.

Evidences of ecclesiastical and other buildings existing prior to Norman times are very scanty. Records of Saxon chroniclers, references to place names, a few sculptured stones, and the traditions handed down from generation to generation, are all that can be adduced. There was a pre-Norman church at Preston, dedicated to St. Wilfrid, there was another at Walton-on-the-Hill, of which only a carved font remains (this font was turned out of the church in 1754 and was used as a mounting block at an adjacent public house until 1817, when it was restored to its original use); there is also a pre-Norman font at Huyton; Childwall is a pre-Norman foundation; so too are Sefton, Ormskirk, and Halsall, while possibly St. Cuthbert's, Churchtown, may be entitled to the same rank.

A site in the parish of Crosby, now enclosed within the walls of the park, would appear to be associated with this period of local history. It was called Harkirke, supposed to have been derived from All hara Cyrice, the hoary, grey, or ancient church. No records are known showing that a church did actually exist here, but the name is significant, and when, early in the seventeenth century, William Blundell, of Little Crosby Hall, enclosed this piece of land as a cemetery for his oppressed co-religionists, he was doubtless influenced by the tradition of the holiness of the spot. In the course of excavations about three hundred silver coins of the ninth and tenth centuries were unearthed.

To the same period belongs St. Cuthbert, who is closely associated with this locality, the churches at North Meols and Halsall being dedicated to him. This Saint died in 637, and was buried at Lindisfarne, but in 875 there was a great inrush of Danes, and according to

an old command laid upon them the monks, with Bishop Eardulf at their head, took up his remains, which had been miraculously preserved, and entered upon what proved to be a seven years wandering. Owing to further Danish invasions these wanderings were renewed, more or less intermittently, until about the last year of



Geo Cross. *Photo.*

ST. CUTHBERT'S, CHURCHTOWN.

the tenth century, when the monks finally settled at Durham, which then became the head of the see. In their wanderings the monks visited many places in Northumbria, and wherever they made a halt of any duration they erected a church and dedicated it to the Saint's memory. Why they came so far south as this

district we do not know, but the suggestion which has been made that at one time they contemplated crossing to Ireland seems to give plausibility to the theory connecting Halsall and North Meols with St. Cuthbert. Halsall Church dates from the fourteenth century, but on an older foundation, and so, in all probability, St. Cuthbert's, Churchtown, was erected on the site of a pre-Norman one.

There is a tradition that Douglas Chapel, which stood at the foot of Parbold Hill, and was demolished in 1878, was founded to commemorate a victory of the Saxons over the Danes, and place names in the vicinity support this.

Colonel Hy. Fishwick, F.S.A., in an article on "The Old Castles of Lancashire," in Vol. XIX. of the Lanc. and Ches. Ant. Soc., says Penwortham is the only castle in the county mentioned in the Domesday survey, though this is not proof positive that no others existed at an earlier period. Excavations made on the site of the Castle Hill at Penwortham in 1856 brought to light remains of prehistoric wooden dwellings, probably of British origin, and of a Saxon kitchen midden. A prick spur and some ironwork of refined workmanship were also found. The castle was built by Warin de Busli, the first Baron Penwortham (or possibly by Roger of Poitou), and it is believed to have comprised a strong square keep, surrounded by a rampart and a ditch. In all probability it disappeared owing to the landslips on the banks of the river. The earls of Chester are said to have held their courts at Penwortham Castle. From the Earls of Chester and Lincoln the barony passed by marriage to Thomas, Earl of Lancaster, and became merged in that Duchy. (Sir J. D. McKenzie, "Castles of England.")

Upholland, according to a writer in the "Pictorial History of Lancashire," is thought to have been the seat of a Saxon chief, and some antiquities, particularly the figure of an "idol," believed to be Roman, have been found there. In the reign of Edward I. it was

held of Thomas, Earl of Lancaster, and the Earl's successors gave it to Sir Robert de Holland, who endowed a chapel there dedicated to St. Thomas, which was afterwards converted into a priory of Benedictine monks.

Old maps show that a castle existed at one time at Croston, while there is some ground for supposing that another existed at the mouth of the Douglas, though it is not probable that either edifice was of great importance.

As to other memorials of these pre-Norman days, few remain even in name. There are the Calderstones, near Liverpool, long supposed to be an ancient druidical circle, and there is the Cymro stone field about half a mile north-east from Scarisbrick Hall, but the stone itself has long since disappeared. This, by the way, is one of the few remaining place names of Celtic origin. About a mile to the eastward of this field is Battle Holmes, a small area slightly elevated above the level of the surrounding land, possibly the site of one of the old but long forgotten battles between the British and Saxons. Both names appear on the ordnance map of 1843.

Norman.

The Norman Conquest marks a distinct epoch in English history, if for no other reason than that it furnishes the first important cadastral survey of the country, namely, the Domesday survey, completed in 1086. Mr. William Farrer (Lanc. and Ches. Ant. Soc., Vol. XVI.) says the Domesday Commissioners have left a very meagre and unsatisfactory account of this district, giving us, with the exception of the survey of the ancient Hundred of West Derby, merely a summary of areas assessable to the Danegeld, areas held in demesne, areas granted to military tenants, areas of forests, and annual values at different periods. The summary given at the end of the survey of the land between the Ribble and the Mersey tells us that in the six hundreds (Darbei, Neutone, Walintune, Blacheburne, Salford, and Lailand)

there were 188 manors in which were 80 geldable hides less one, that is, 474 teamlands. In the time of King Edward the Confessor, it was worth £145 2s. 2d. When Count Roger received it from the King it was worth £120, no great diminution of value when it is remembered that the conquest of the Kingdom had been in progress during that period. It hardly bears out the suggestion that this district had been laid waste. As a matter of fact, as compared with Cheshire and many parts of Yorkshire, or with Amounderness, that part of Lancashire lying immediately to the north of the Ribble estuary, this district passed through the period of conquest almost unscathed, and with fewer changes of actual ownership than might be supposed. Very many of the descendants of the Saxon and Danish thanes living at the Conquest possessed their ancestral estates for generations, and if others fell to the position of villeins they actually underwent no great change of status. Perhaps it was the fortunate escape of this district from the fire and sword of the conqueror, who laid waste the neighbouring shires, which gave birth to the ancient rhyme :—

When all England is alofte,
Hail are they in Christis croft,
And where should Christis croft be
But between Ribble and Mersea.

Roger of Poitou, a relative of the Conqueror, was given a large share of the plunder, having a grant made to him of 398 manors of which 188 were situated between the Ribble and the Mersey. He twice rebelled, and was twice deprived of his possessions. On the second occasion the greater portion of his Lancashire estate was bestowed upon Ranulf, third Earl of Chester, but these lands never formed part of the Palatinate of Chester. On the death of the sixth earl, and the extinction of the male line of the family in 1232, the district passed to one of his sisters and co-heirs, Agnes, wife of William de Ferrars, and was shortly afterwards incorporated in the newly formed county of Lancaster.

Some of the names of manors or townships mentioned in Domesday are still recognisable, some have been entirely lost, some have, apparently, fallen from their high estate, like Hurleston, a place mentioned several times, but which is now an insignificant part of Scarisbrick, while as to others doubts still linger.

In respect to these latter the most noticeable are those in which the word Meols is compounded. The word is variously spelt Mele, Meoles, Moeles, Melys, Meyls, Moles, Meiles, Mealez, Melez, and Meols, a word of Scandinavian origin, which it is now agreed refers to the sandhills which fringe the shores of Lancashire and Cheshire. It is worth while to note what is recorded of the places along this part of the coast, forming part of the estate of Roger of Poitou. Thus:—

> Five thanes held Otegrimele. There is half a hide. It was worth ten shillings.
>
> Wibert held Erengermeles. There are two carucates of land. It was worth viii shillings. The land was quit (of every tax) except the gelt.
>
> Three thanes Einulvesdel. There are two carucates of land. It was worth lxiv pence.
>
> Three thanes held Fornebei for three manors. There are four carucates of land. It was worth ten shillings.
>
> Three thanes held Mele for three manors. There is half a hide. It was worth viii shillings.

County historians have not agreed as to the indentification of these places, but for the purpose of this article the authority of Mr. William Farrer may be followed, who ascribes these names, in the order given, to North Meols, Birkdale (part of), Ainsdale, Formby, and Raven Meols (Formby).

According to Mr. Farrer the five thanes who held Otegrimele were probably the descendants of Odda, the son of Grim, who appears to have been the original Norse settler among the sandhills or mels of this place.

Erengermeles was also subsequently known as Argarmeles, being occasionally mentioned in conjunction with Otegrimele, Otringmele (North Meols), and was clearly a well known place in 1361: it was destroyed probably before the end of the fourteenth century, or very early in the fifteenth. The proof of this is found in the pleadings in a suit in the Duchy Court of Henry VII., 1503-4, between the King's escheator of Lancashire and Sir Henry Halsall, Knight, the matter in dispute being the title to lands in North Meols and Scarisbrick. The defendant admitted that his lands in North Meols were held of the king as of his duchy by service of the fourth part of a knight's fee, but contended that Argarmelys, with all the lands and tenements belonging to it, were, long before the decease of his father, Hugh Halsall, "drowned and adnichilate with a high sea oute of the lawgh water mark, and also oute off the body of the country, so that they were not held either of the king or any other person."

In the same district, and no doubt destroyed about the same time, was Arnoldesdale, or Aynesdale, as to which there is an old record; 2 and 3 Philip and Mary (1555-6), as to land in Birkdale. Henry Halsall, Esq., deposed that there was no manor in Lancashire called Arnoldesdale, but he had often heard it reported that for a truth there was a certain town in times past called Aynesdale, near adjoining the lands in dispute (in Birkdale) and that the said town time out of mind had been and still was "overflown with the sea so that there remains no remembrance thereof now." (The evidence is quoted at length in Mr. Farrer's "History of the Parish of North Meols.")

The name, however, has survived, for we have Ainsdale still with us as a township not far from Southport. Across the Ribble other lands have been lost, including the village of Wadden Thorpe before mentioned, and Kelgrymoles, near Lytham, another of the places whose name is compounded with the general term for sandhills.

THE RELIGIOUS HOUSES.

The remains of religious houses in the neighbourhood are few and unimportant, Burscough Priory alone showing any indications of its former glory. This was a house of the Augustine Canons, founded by Robert, son of Henry de Latham, in the reign of Richard I., and was



C. Woodall. *Photo*

BURSCOUGH PRIORY.

dedicated to St. Nicholas. The founder granted to them the Church at Flixton, the mill at Lathom, and the place called S. Leonard's at Knowsley. Walter de Scarisbrick gave land at Scarisbrick and Hawkshead; Henry de Parbold (Perbolt) gave land there, and the Canons had many other benefactions in the surrounding villages. By royal charter they were granted in 1286 a market at Ormskirk every Thursday, and a fair at the feast of St. John the Baptist. In addition Henry de Lacy, Earl of

Lincoln, gave a place called Ruddegate (which has not yet been identified), on condition that the Canons should receive and look after a leper from his fee of Widnes, if there were any, and give him reasonable sustenance; after the death of one, another to be admitted. At the dissolution the occupants consisted of the Prior, five Canons, and forty servants. The revenues at that time amounted to £129 1s. 10d. gross, £80 7s. 7d. net, arising from property at Burscough, Marton, Dalton, and Ormskirk, and the rectories of Ormskirk, Huyton, and Radcliff in Nottinghamshire. The Priory comprised a church with several altars, a chapter house, a prior's lodgings, a mill, a grange, and a hospital for lepers. The church was a good specimen of early Gothic architecture, but all that remains of it are two piles of masonry forming part of the intersection of the nave by the north transept, and sundry other fragments.

Mention of the leper hospital suggests that leprosy must have been rather common in those days, for not only was provision made here, but at Preston and other places, for the treatment of the unfortunate sufferers.

Upholland Priory was one of the three houses in Lancashire under the rule of the Benedictines, the others being the cells at Lytham and Penwortham. The original foundation of Holland Priory, in 1307 (Mon. Ang., Vol. IV., p. 409), consisted of a college or chantry, a dean and twelve secular priests in the church of S. Thomas the Martyr. These were changed in 1319 by Walter, Bishop of Coventry and Lichfield, at the request of Sir Robert de Holand, the founder, into a Benedictine establishment under the rule of a prior. The method for the appointment of a new prior was laid down somewhat curiously. The monks were to submit the names of three of their number to the patron, who was then to select one of the three and present him to the diocesan. The first prior bore the name of Thomas de Doncaster, from which it is supposed that the first Benedictines to take up their residence here came from some Yorkshire house.

The property of the house lay in Holland, Childwall, Markland, Garstang, &c. At the Dissolution the net revenues amounted to £53 3s. 4d. The site of the house and certain lands in Holland, Orrell, Wigan, and Pemberton, of the clear annual value of £16 14s. 0½d., were sold to John Holcroft for twenty years purchase, and £10 12s. for timber, amounting to £344 12s. 10d. The church of the late priory, with the steeple and bells, a chamber at the west end of the church, a garden adjoining, and the churchyard, were excepted from the grant as being parochial property. The Priory bore the arms of the Hollands, Azure, a lion rampant, guardant, between eight fleurs-de-lis argent; over all, on a bend, gules, three keys, wards upmost, or. Besides the church, there are some few remains in adjoining houses.

Penwortham Priory was a cell to Evesham Abbey, the connection arising through the wife of one of the first benefactors. The foundation arose, according to Tanner, from Warin Bussel, who gave the church and tithes of Penwortham and other property in the county to the monks of Evesham in the reign of William the Conqueror (Mon. Ang., Vol. III., p. 417). A colony of monks was sent from Evesham who built the Priory, which was dedicated to the Virgin Mary, and was probably the earliest in the county. Among other benefactors was Henry IV., as Duke of Lancaster and Earl of Derby.

At the time of the Dissolution the revenues amounted to £114 16s. 10d., and the property besides that in Penwortham itself consisted of the rectory of Leyland, land and rents in Leyland, Farrington, Longton, Euxton, Freckleton, and Warrington; also the chapel of Meoles or Moles, and a rent of 6s. 8d. in North Meles. This chapel of Meols subsequently became a rectory, the patronage of which remained in the hands of the Priory to the last. The site of the Priory, together with other property, was granted to John Fleetwood, of Heskin, for £861 15s., being twenty years purchase on the net estimated rental of £43 1s. 3d.; a further sum of £13 10s. was paid for the timber, and £19 3s. 8d. for the advow-

sons of North Meols and Leyland, making altogether £893 18s. 8d. The Fleetwoods held possession for about two hundred years, and then in 1749 the estate passed by purchase to John Aspinall, three years later to James Barton, of Ormskirk, merchant, and lastly to the Rawstornes, who are the present owners. Penwortham, it may be added, was a royal demesne in the time of Edward the Confessor, and was worth three pounds according to the Domesday survey. There was a ford and a ferry here, and it is not unlikely that the monks held the latter as part of their possessions as their brethren at Birkenhead held the ferry across the Mersey, which at the time of the Dissolution in 1536 was worth £4 6s. 8d.

At Preston there was a Franciscan Friary, from which Friargate takes its name. Leland, in his Itinerary (Vol. IV., p. 22), says: "The Grey Freres College in the north west side of the towne of Preston in Acmundrenes was sette in the soile of a gentleman caullid Prestun, dwelling yn the Towne self of Preston, and a brother or sunne of his confirmed the first graunt of the site of the House, and one of these two was after a great man of possessions, and Viscount of Gurmaston, as I hard say, in Ireland. Diverse of the Prestons were buried yn this House. But the original and great builder of this House was Edmund, Erle of Lancastre, sunne to Henry the thyrde. Syr Robert Holand, that accusid Thomas, Erle of Lancastre, of treasun, was a great benefactor to this House, and ther was buried. This Holand, as I hard, was founder of the Priory of Holand, a place of Blake Munkes by Latham in Lancastreshir. There lay in the Grey Freres at Prestun divers of the Shirburns and Daltuns, gentilmen."

At the Dissolution the site was granted to Thomas Holcroft. Baines describes it as "a small square collegiate building, with a chapel attached to its quadrangular cloisters. It was at one time the residence of the Breres, of Hammerton, in Bowland. Later it became a House of Correction, and was used as such

until the erection of the prison at the bottom of Church-street in 1790. The site now forms part of Messrs. Stevenson's ironfoundry."

Not very far away was the S. Mary Magdalen Hospital, established for the reception of lepers. It is mentioned in the Taxation of Pope Nicholas in 1261, and the mastership was in the gift of the crown. The site is still known as Maudlands (*vide* Baines).

At Warrington there was an establishment of the Austin Friars, founded near the end of the thirteenth century. Leland, in his Itinerary (Vol. VII., p. 47), says, "Warrington (a paved town), one Church, a Freres Augustine at the bridge end." The Friary seems to have been on the Cheshire side of the bridge, and Sir Peter Leicester, in his "Antiquities of Chester" (p. 253), gives the following account of it:—"Anno Domini, 1379, 3 Richard II., William Eltonhed, Prior of the Hermit Friars of the Order of S. Augustine, at Warrington, in Lancashire, and the convent there, granted to Sir Thomas Dutton, Knight, a perpetual chantry, to wit, that a sufficient Frier of the convent of Warrington shall be specially elected to pray for the salvation of Sir Thomas, his children, and of Phillippa his wife, and her parents; and for the soul of Dame Ellen, late wife of the said Sir Thomas, their children and parents, when they shall die, at the great altar of their church yearly for ever; and that their names shall be written down in their Martyrology: whereunto the Prior and convent were bound, under a penalty of 3s. 4d., to be levied by the provincial upon omission of such form of service; and if for a week or a fortnight it were omitted, then they must double the fine omitted in the manner aforesaid. If neglected for six months, then upon pain of suspension: if for a year, then upon excommunication until the time omitted be made up. Whereunto are witnesses, Thomas, Abbot of St. Werburg of Chester; Stephen, Abbot of Vale Royal; Richard, Prior of Norton, and Roger, Prior of Berkenhead." This was confirmed by Henry de Townsdale, Provincial of the Hermit Friars of S. Augus-

tine in England, with a special injunction that the said persons be yearly twice commemorated before the whole convent, once at the entrance of the Prior of Warrington into the Convocation House yearly, the other upon the election day of a fellow Prior for a provincial convocation. Dated at Warrington on Sunday next after the feast of S. Martin, in the year aforesaid."

In September, 1386 (*vide* Baines), certain commissioners appointed to take evidence in the celebrated heraldic quarrel between the Scropes and the Grosvenors, sat for three days in the Friary Church to examine witnesses. At the Dissolution the site was granted to Thomas Holcroft, and the memory of the House is still preserved in the names Friars Gate and Friars Green. In 1886, in the course of some improvements by the Corporation, a considerable part of the foundations of the church was unearthed; numerous tiles, pieces of carved stone, and other objects were removed to the Museum, and an inscription was placed on an adjacent building.

THE OLD HALLS.

Lancashire is particularly rich in old halls and manor houses, and this district has many specimens of great architectural interest. At the commencement of the seventeenth century there were about three hundred halls and manor houses in the county, but most of those now standing are simply farm houses, and so much altered that the original design is followed with difficulty. These halls, speaking now more especially of the half-timbered or "black and white" buildings, with their interlacing woodwork, plaster fillings, and many gables, are eloquent of the time when timber was plentiful in the land. In the construction of these halls wood was used with great effect, and also, as we in more utilitarian days would say, with great waste. A glance for instance at the upper portions of Heskin Hall will be sufficient to bear out this statement.

It would be impossible in a short article to describe all the old halls of the district, but a brief mention must

be made of a few. Rufford Old Hall claims first attention, because it is the best example of its kind in our neighbourhood. It has a very picturesque appearance, while the interior is still more attractive. Its chief feature is the large banqueting hall, with hammer-beam roof, the principals of which are richly carved in many and quaint designs, and in the wood-work generally there is such a wealth of detail and excellence of execution as to prove that the Hesketh, who are still the owners, were a family of note so long ago as the fifteenth century. At one end of the hall is a carved screen which is unique in the district, the only other being at Samlesbury Hall, near Preston, but this has been so remodelled that its original appearance has been destroyed.

Lydiate Hall, once surrounded by a moat, is one of the smaller halls of the county, but of considerable interest, though modern additions have somewhat detracted from its general appearance. From the massiveness of its construction and the richness of its ornamentation it was clearly built by persons of good estate. The chief interest lies in the great hall, which has a flat ceiling like that at Speke, supported by massive carved oak beams. This is after the style of the later manorial halls, where the insertion of a low ceiling in the great hall gave the occupiers another floor. At the southern end there is an elaborately carved and moulded canopy with thirty-six panels. At the western end of the dais was the ladies' bower, supported by a wooden arch, but this portion has been removed. There were two "priests' hiding places," one in the south wing, and the other entered from a room above the central hall.

Close by are the ruins of perhaps the smallest church in the county. It was erected by Lawrence and Katherine Ireland about 1567, and consisted of a nave and western tower. The chancel was originally enriched with alabaster panels on the re-table. These panels were removed probably to Lydiate Hall, for they were taken thence in 1854 to the new Roman Catholic Church, which stands



Photo.

LYDIAN HALL.

W. & J. Sim.

almost facing the Hall. These panels, four in number, represent incidents connected with the legend of St. Katherine, who was ordered to be put to death on the wheel at Alexandria by the Emperor Maxentius: according to the legend, however, the wheel snapped, but this did not save her, and she was subsequently beheaded. A figure of St. Cuthbert, probably removed from Halsall Church, is also utilised as an adornment of the pulpit.

Hurleston Hall, to the left of the road from Southport to Ormskirk, is an example of the comparatively recent insertion of a second floor in the great hall. It is smaller than Lydiate, but the plain arching timbers of the central apartment would indicate that it is of earlier date. It had at one end a minstrel gallery, reached by a flight of stone steps, but probably this staircase does not form part of the original structure. Many other alterations have been made in the old building. Like other places of its kind in the locality, it is credited with being the home of a "boggart," or ghost.

Mawdesley Hall, near Rufford, is shown by dates in the interior to have been erected in the seventeenth century. It retains much of its ancient form, but the wings were rebuilt little more than a century ago, one of stone and the other of brick.

Heskin Hall, to which allusion has already been made, does not come under the category of the half-timbered buildings. In its oldest parts it dates back about three hundred years; it is a roomy structure, built chiefly of brick, and contains a secret suite of rooms for use as a hiding place. Its forerunner, Heskin Old Hall, was pulled down many years ago, and an old-fashioned farmhouse stands in its place.

Hoghton Tower was built in the sixteenth century, near the site of an older manor house, and has been recently restored. It is a stone structure with two quadrangles, and is situated on an eminence commanding a view of a wide expanse of country. It has played a prominent part in local history, and is the place

in which it is said that King James I. in merry mood knighted the loin of beef on the occasion of his visit to the Tower in 1617. The banqueting hall in which this took place, a fine room, with musicians' gallery, wide open fire-place, and commodious alcoves, is still shown, together with the table at which the king and his courtiers sat. It was during this visit that a petition was presented to James by the peasantry, complaining that they were being hindered by the Puritans from having their lawful diversions on Sundays, and praying that the restrictions imposed by Queen Elizabeth on Sunday amusements might be withdrawn. The outcome of this was that in the following year the King issued his famous "Book of Sports," wherein it was provided that dancing of men and women, Morris dancing, may-pole dancing, and other "honest sports," might be enjoyed by those who had not neglected attendance at divine service. In 1643, during the Civil War, this Book of Sports was condemned by Parliament and ordered to be burnt by the common hangman. At this time Lancashire Royalists were sorely beset. Preston surrendered to Sir John Seton, who sent a party to Hoghton Tower, then the seat of Sir Gilbert Hoghton. The place surrendered, but when the attacking party led by Captain Starkey had entered, the tower between the two quadrangles was blown up and the captain and two hundred men perished. How the explosion was occasioned, whether by accident or treachery, has not been clearly established. In the inner court is a statue of King William III. in demi-armour, sent hither from



HOGHTON TOWER.

Walton Hall when that building was taken down in 1834.

Lathom House, near Ormskirk, was likewise a place of great importance. According to Colonel Fishwick ("Old Castles of Lancashire," Lanc. and Ches. Ant. Soc., Vol. XIX.) there is no evidence to show that a castle existed when the estate passed into the Stanley family in the time of Henry IV., but before 1495 Thomas Stanley, the first Earl of Derby, pulled down the old manor house and built what was afterwards known as Lathom Hall, or Lathom House, which was to all intents and purposes a fortified castle. Seacome describes Lathom as "surrounded with a wall six feet thick, upon which were nine towers, in each of which were six pieces of ordnance that plaid three one way and three the other. Outside the wall was a moat, eight yards wide, and inside there was a high strong tower called the Eagle Tower, also two other towers." Lathom House is famous for its defence by the Countess of Derby, the brave Charlotte de la Tremouille, who, with her little garrison of three hundred men, defied the Parliamentary forces for nearly a year. On the occasion of a second attack in 1645, when she had gone to join her husband in the Isle of Man, of which he was king, the house fell before a force of four thousand men after a siege of five months.

The fall of Lathom House was celebrated with great rejoicings in London, and by order of Parliament the house was totally demolished, scarcely a stone remaining. James, seventh Earl of Derby, afterwards surrendered as a prisoner of war, and in 1651 was beheaded at Bolton, on a scaffold the timbers of which are said to have been taken from Lathom House. His remains were buried at Ormskirk Church. His heroic countess, betrayed into her enemies' hands, remained a prisoner until the Restoration, and died at Knowsley in 1663. Sir J. D. Mackenzie in his "Castles of England," says the estate had been held by the Lathom family since Saxon times, though this is open to question, and passed

by marriage to Sir John Stanley about the end of the fourteenth century. The Stanleys continued in possession for three hundred years, and then on the death of the ninth earl the estate became the property of the Bootle Wilbrahams, the ancestors of the present owner, the Earl of Lathom. The Lathom House of to-day stands on the site of the older structure, and from time to time relics of the famous sieges have been unearthed.

Standish Hall, the home of the family of that name, is notable as the place where the "Lancashire plot" for replacing the Stuarts on the throne was concocted in 1694.

Ashurst Hall has almost entirely disappeared. There remain, however, the gateway, with the family coat of arms on a panel, the guard rooms on each side, and, close by, the old dovecote, all familiar objects to summer visitors to Ashurst Beacon. Curiously enough, a dovecote is the only portion remaining of the old Meols Hall, Churchtown.

On the opposite side of the Douglas valley from Ashurst is Harrock Hall, a stone edifice, the home of the Rigbys, who figured prominently in the Civil Wars.

Crosby Hall was the ancestral home of one branch of the family of Blundells, who were among the stoutest recusants in the days when in turn the Roman Catholics were persecuted for their religion. It was William Blundell who established a small cemetery in his park when the Parish Churchyard at Sefton was closed to the Roman Catholics in 1611. The exclusion lasted for twenty years, and about 80 interments took place in this private burial ground. This exposed the family to still further persecutions, William Blundell being imprisoned and also "grievously fined," his fine amounting to £2,000. At one time he and his father were in prison together, and the latter ended his days there. Campion, the last priest to be executed, was in hiding in West Lancashire for a couple of years before his capture and death in 1581. Amongst his hiding places was Meols Hall (where he spent

some time between Easter and Whitsuntide of 1580), and Dame Hesketh, wife of Bartholomew Hesketh, was one of the persons against whom legal proceedings were taken for recusancy.

Ince Blundell Hall, the residence of Mr. C. J. Weld-Blundell, is comparatively modern. It contains a magnificent collection of antiquities, housed in an annexe styled the Pantheon.

If space permitted many other halls might be enumerated. Like some of those to which reference has already been made they belong to the minor halls of the county, but are well worthy of inspection. In Preston, in Wigan, and in Warrington there were in former times many examples of mediæval architecture, but nearly the whole of these have been swept away to make room for modern improvements. In some of the out-of-the-way villages half-timbered farmhouses, cottages, and barns may still be seen, in the vicinity of Mawdesley in particular. Of modern structures, designed on the lines of these old halls, Scarisbrick Hall, near Southport, is the most noteworthy, and it will ever stand to the credit of the elder Pugin. The banqueting hall is said to have been modelled on the lines of that at Rufford, and this and other apartments contain splendid examples of ancient and modern carving.

THE OLD CHURCHES.

Some attention must now be paid to the old Churches, and St. Cuthbert's, Churchtown, comes first geographically. "The Chapel of Moles" is mentioned as early as 1113, but, as previously remarked, it is probable that a place of worship existed here in much earlier times. In 1556 the rectory was held by the Bishop of Sodor and Man, who also held the rich livings of Winwick and Wigan, in Lancashire, and Badsworth, in Yorkshire. In 1571 the church was rebuilt of stone. In 1730 the greater part of the present church was built (the older edifice having been destroyed or badly damaged by fire),

and in 1739 the tower and spire were erected. In 1863 the church was again partially rebuilt, so that little of the old edifice remains. The most interesting of its monuments is a tablet to the memory of Mr. Thomas Fleet-



F. Frith & Co., Ltd. *Photo.*

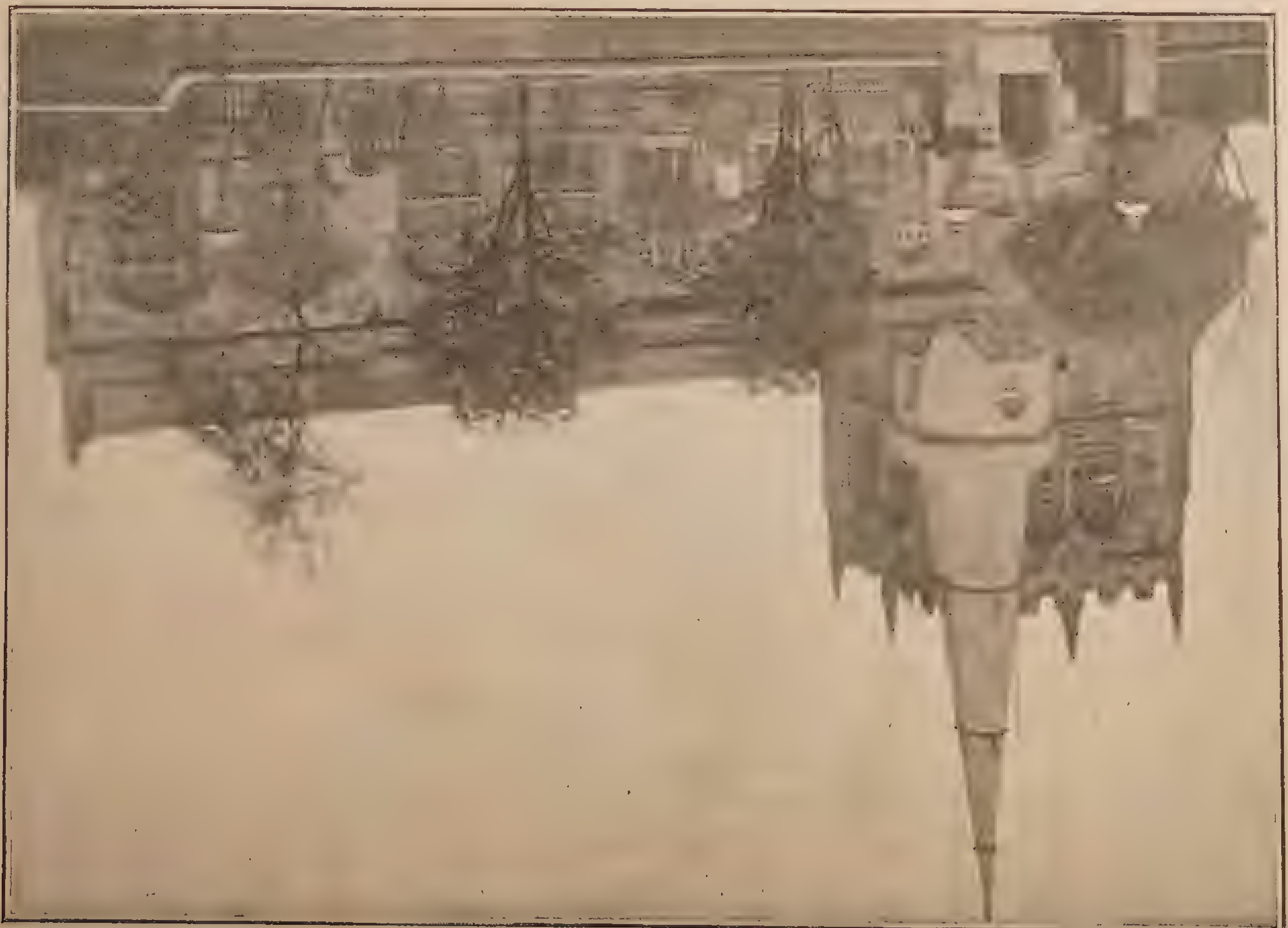
HALSALL CHURCH

wood, of Bank Hall (who died in 1717), who was the first to attempt the drainage of Martin Mere. Until a few years ago it possessed a three decker pulpit, and an ancient custom is still followed in the election of the lay

officers. The lords of the manor (the Hesketh and the Scarisbricks) each appoint one warden and one sidesman, and the Rector appoints a third warden and a third sidesman for the district of Birkdale. although Birkdale has long ceased to be part of the ecclesiastical parish of North Meols. Close by the Church is a building which served as a grammar school, prior to the erection of the National Schools. It was founded by Edward Halsall in 1593, and endowed with twenty marks a year, out of lands at Eccleston, Sutton, and Ditton, but his will makes no mention of this foundation.

Halsall (the Heleshale of Domesday) possesses a fine church of fourteenth and fifteenth century date. It has, however, undergone several processes of re-building, the last having taken place in 1886. The Church consists of a nave, a stately chancel, and a tower at the west end surmounted by a well-proportioned spire. At one time there were four altars and a wide rood loft in the church. On each side of the chancel there are six choir stalls with misereres, and in the north wall of the chancel (which is clearly part of the older structure) there is a canopied altar tomb, with an effigy of the Rev. R. Halsall (Rector of Halsall from 1513 to 1563) in ecclesiastical vestments. On the opposite side there is another altar tomb, with the recumbent figures of a knight and a lady, supposed to be those of Sir Henry Halsall, knight—who founded a chantry at the altar of Our Lady the Virgin in the church, and died in 1523—and his wife, Margaret, daughter of James Stanley, Bishop of Ely. Forming part of the edifice is the old grammar school, now used as a choir vestry. This school was founded in 1593 by Edward Halsall, though it was not originally an annexe of the church.

Ormskirk Church is remarkable as having both a tower and a spire standing side by side, the former being of very massive construction with walls seven feet thick. The foundation of the church is popularly ascribed to Orm, a converted Danish pirate, who also gave his name to the headland at Llandudno, and the tower and spire



ORMSKIRK CHURCH. *Photo.*

are (again falling back on popular tradition) ascribed to the whims of his daughters. The more probable theory is that the square tower was built for the reception of a peal of bells in the sixteenth century, the octagonal tower and spire at the end of the south aisle being the original western termination. Some of the masonry of the Norman church still exists, including a fine window in the north wall of the chancel, while a stone now built into the eastern wall and evidently part of the ancient font is believed by some writers to be a relic of the Saxon church. There were eleven or thirteen chantries attached to the church, but these were abolished in 1548. In the Derby and Scarisbrick Chapels are monumental effigies and mural tablets to the memory of members of these two families, some of whose remains were removed from Burscough Priory on its suppression. The church underwent a very thorough restoration between the years 1878-1891.

Sephton, or Sefton Church, dedicated to St. Helen, is one of the oldest churches in the county, and is reputed to have been the last in England in which mass was said according to pre-reformation usage. The church consists of a lofty nave, with north and south aisles, a chancel separated from the nave by a rich carved screen, and the Bulkley Chapel with another fine screen. In the chancel there are sixteen stalls of black oak, also elaborately carved. Two effigies of knights in armour are the oldest and most interesting of the monuments, many of which relate to the Molineux, Ireland, and Blundell families. That a Norman church existed here is inferred from some remaining fragments; the bulk of the present edifice, however, dates from the sixteenth century, though portions of the former edifice remain in the fourteenth century tower and spire, and the fifteenth century north aisle.

Aughton Church, near Ormskirk, possesses a Norman doorway, so that it, too, must be reckoned among the ancient churches; whilst those at Preston, Wigan, Winwick, Huyton, Warrington, Childwall, and Eccleston also date back to very early days.

Closely connected with the churches are the numerous wayside crosses of the county. Old maps show, in some places, distinct lines of crosses converging upon ecclesiastical buildings, such as Ormskirk Church. The majority were used as resting places on the occasion of funerals by the Roman Catholics, a fact which lead over zealous Protestants to demolish all within reach. In addition to these wayside crosses there were market crosses, where all declarations were promulgated and public business



Geo. Cross. *Photo.*

INTERIOR, SEFTON CHURCH.

transacted; there were also the village crosses, preaching, weeping, churchyard, and sanctuary crosses, as well as crosses or boundary stones erected to mark the divisions of estates; but through indifference, vandalism, and the necessity for public improvements, very many of these have disappeared. On this subject Mr. Henry Taylor, F.S.A., of Birkdale, has written and published a number of valuable articles to which students must be referred.

A few items as to the social life of the people may be added, although it is only as we near our own day that we get any reliable information. Food was poor, living accommodation corresponded, and work would be almost continuous. At holiday times there was a good deal of eating and drinking, as though to improve the average, and one can scarcely wonder that excesses should take place. Among the chief amusements were bull baiting, bear baiting, and cock fighting. Sephton was a great centre of the game of bowls, and it is rather curious to note how strong a hold this game still has upon the inhabitants of the towns and villages of the county. Festivals were held under the aegis of the Church, as for example, "the flowering of the cross" at Formby, Crosby, Altcar, and other places; these, together with rushbearing, and the decoration of wells being traceable to a remote antiquity.

Of the rushbearing at Altcar the Rev. W. Warburton writes that the first man who fell into a drunken sleep on the Monday following Rushbearing Sunday was appointed Mayor elect. On the following day the Mayor, dressed in old clothes and an old hat, and with face blackened, was accompanied round the parish by neighbours, decorated with ribbons, who danced round him, playing tambourines, fiddles, and other instruments, submitting him the while to various indignities. As they went they collected money which was spent in drink. Horse racing near Aughton was very much in vogue during the seventeenth century. In the constable's accounts at Ormskirk, under the date April 19, 1794, there is an entry "Warning not to go disguised at Easter, sixpence," evidently referring to some such custom as "Pace egging," or mumming, and from this warning it must be assumed that the practice had become objectionable from some cause or other.

The punishments meted out to offenders were in accord with the rude spirit of the age. There were the stocks for the drunkards and vagabonds, and the dungeon and pillory for worse offenders, and the ducking

stool for quarrelsome women. Whether the brank was used we cannot say, but an entry of an iron bridle in the Ormskirk constable's accounts would lead one to suppose that it was. It occurs in a list of articles handed over to the new constable in 1773, "One large constable's staff, one small ditto, two pairs of handcuffs with locks and one key, an iron bridle, a dungeon key and two other keys, a lock for the stocks, and a cat o' th' nine tails."

A little later a ducking stool and a whip are also mentioned. According to Mr. George Lea, in his "Handbook to Ormskirk," Aughton-street appears to have been the place where all the punishments were inflicted. It was here that the dungeon was situated, that the pillory stood, that the stocks were fixed when they were brought out of their resting place in the church tower, and where the ducking stool stood near to the brook. The last named mode of punishment dates probably from the old Saxon days, and this particular stool was removed in 1780. At Churchtown, according to Mr. Bland's "Annals of Southport," the stocks were last used in 1861, when an offender was imprisoned therein six hours for drunkenness. These stocks, minus the top bar, are still to be seen adjacent to the churchyard wall. Man traps and spring guns were used to ward off depredators of another sort, and a couple of notices as to these engines may still be seen in fields near Mawdesley, although the actual implements are no longer to be found there.

There are numerous entries in the old accounts of the churchwardens for expenditure on wine, ale, decorations, etc., at the fixed festivals (rush-bearing, gunpowder plot, etc.), and occasions of national rejoicings, but as a rule these cease before the end of the eighteenth century. In the Altcar accounts there are also payments made in respect to the visits of neighbouring choirs, as for example those of Halsall, Maghull, and Formby, showing the existence of a very fraternal spirit among the people.

Mock Corporations existed in several places, chiefly for purposes of conviviality. There was one at Newburgh, which came to an end in 1832, another at Churchtown, another at Sephton, and still another at Walton-le-Dale, Preston.

A relic of the old Norman customs may still be traced in the ringing of the curfew bell at Ormskirk, Halsall, and Eccleston, though at Halsall the ringing of the bell is said to have answered quite another purpose in more recent times, as it served to guide belated passengers over the moss surrounding the village.

The spirit of conflict inherited from tribal times, continued strong in this locality, for we read of constant struggles between the inhabitants of Tarleton and Sollom for the possession of a village cross, claimed by both parties, the dispute being ended only after the stone had been flung into a horse pond, and between the agriculturalists and fishermen of Formby and Altcar for apparently no reason at all.

Altcar was at one time a fenny district, and within comparatively modern days we read of hay being carried from the lower meadows to the higher land to be dried, and of one farmer keeping a boat tied up to his kitchen door so as to be convenient for the person going to the shippon to milk the cows. The old Martin Mere district would not be much better, for up to within the last century, before the land had got as consolidated as it is at present, it was customary to fix flat pieces of wood to the feet of the horses when ploughing, to prevent them sinking into the boggy land. In fact it was no uncommon thing for a young horse to be lost through nervousness and kicking off its wooden shoes.

Sketch of the Life and Works

of

Rev. JEREMIAH HORROX.

By G. Napier Clark.

THE village of Hoole, which lies nine miles directly E.N.E. of Southport, is proud of the fact that the Rev. Jeremiah Horrox, "a prodigy for his skill in astronomy," taught its children and ministered to its people, though only for a brief period between June, 1639, and July, 1640. It was while living there in 1639 that he, at the youthful age of 20, corrected the ephemerides of the astronomers Kepler and Lansberg, for the planet Venus, and proved the accuracy of his own calculations by observing, within two minutes of the time he reckoned, that planet on the face of the sun.

A church had existed at Hoole, or Much Hoole, from the fifteenth century, but the present edifice, dedicated to St. Michael, of which Horrox was curate, was built in 1628. It was in those days simply a Chapel of Ease to the ancient Church of Croston, which is distant about three or four miles. A stone tower was raised in 1720, and a chancel added in 1824. In 1857 an appeal was made by the Rev. Robert Brickell, Rector of Hoole, to the Lancashire public and to scientists generally for subscriptions to commemorate the name of his distinguished predecessor, with the result that in 1859 a Horrox Chapel, with a memorial window, was added to the church, and the old pulpit from which he preached

was restored. A marble tablet also was placed in the church by the clergy, and a clock in the tower by the parishioners.

The story of his short life, from the few details which can now be gathered, is interesting and pathetic. He was born at Toxteth, near Liverpool, in 1619, where his father was a small farmer. As his parents, relatives, and neighbours were strict Puritans, he passed his childhood



D. E. Benson. *Photo.*

HOOLE CHURCH.

amidst the prevailing moroseness and austerity of the time. He began his studies at an early age, and at 14 he was sent to Emmanuel College, Cambridge, where he conceived a passion for the study of astronomy. He writes at this time, "It seemed to me that nothing could be more noble than to contemplate the manifold wisdom of my Creator as displayed amidst such glorious works; nothing more delightful than to view them no longer with the gaze of vulgar admiration, but with a

desire to know their causes and to feed upon their beauty by a more careful examination of their mechanism." But the difficulty of studying mathematics and astronomy at that time was great. He had no teacher and very few books, and the success he gained he owed to his own genius and determination. He relates his difficulties in the following touching words:—

"There were many hindrances. The abstruse nature of the study, my inexperience and want of means dispirited me. I was much pained not to have any one to whom I could look for guidance, or indeed for the sympathy of companionship in my endeavours, and I was assailed by the langour and weariness which are inseparable from every great undertaking. What, then, was to be done? I could not make the pursuit an easy one, much less increase my fortune, and least of all, imbue others with a love of astronomy; and yet to complain of philosophy on account of its difficulties would be foolish and unworthy. I determined, therefore, that the tediousness of study should be overcome by industry; my poverty, failing a better method, by patience; and that instead of a master I would use astronomical books. Armed with these weapons I would contend successfully; and having heard of others acquiring knowledge without greater help, I would blush that anyone should be able to do more than I. Always remembering that word of Virgil's

'Totidem nobis animæque manusque.'"

During his stay at College he read and studied the lives and works of Tycho Brahe and Kepler. He says he experienced great delight in thinking of the fame of these excellent masters in the science, and that he would seek to emulate them in his aspirations. Having heard the Tables of Lansberg, the Belgian astronomer, highly praised, he procured a copy with great difficulty, devoted the whole of his energies to its perusal, and recomputed these ephemerides for several years. Afterwards, when he found how erroneous these tables were, he regretted

the misapplication of his time; but the time was not really misspent, for it led him in the future to rely upon his "own eyes to observe the position of the stars in the heavens."

In 1636 he became acquainted with William Crabtree, of Broughton, Manchester, an astronomer and "famous mathematician." This acquaintance ripened into an affectionate friendship, for afterwards he calls him "my very great friend," and "my mostly dearly beloved friend." And Crabtree, on the other hand, called Horrox his "second self." To this friendship we owe everything which is known of the works and discoveries of Horrox, for all his papers were lost with the exception of those treasured and preserved by his friend.

After spending three years at Cambridge he returned to his father's house at Toxteth. We gather that there he not only met with no sympathy but even encountered opposition in the pursuit of the study which had now possessed his mind and soul. But, although discouraged and opposed, he steadily held on his way. To his beloved friend Crabtree he communicated his thoughts and unburdened his soul. He told him of his trials, of the troubles he had with his instruments, of the contrivances he employed to assist him in his observations, and complained of his ill equipment generally. About this time he succeeded in making a telescope of such power as to show spots on the sun, the same instrument with which he observed the eclipse of the sun in May, 1639, and the transit of Venus in November of the same year. In June, 1637, he obtained the Rudolphine Tables published by Kepler; and in the same year he wrote a dissertation defending the Keplerian astronomy against the hypotheses of Lansberg. With the aid of Kepler's tables, which he amended, he discovered the inequality of the mean motions of Jupiter and Saturn. The acceleration of the mean motion of Jupiter seemed to him to amount to 1′ for every ten years, and evidently, from the words he uses, he thought this inequality to be *periodic*. The mean motion of Saturn, on the other hand, he found was retarded. He says these phenomena

would occasion him greater annoyance were it not that there was some consolation in being the first who discovered them.

He also gave his attention to the movements of Comets, and after a considerable amount of thought and study he eventually came to the conclusion that Comets *move in elliptic orbits (or nearly elliptic orbits), and that they are carried round the sun with a velocity which is probably variable.*

In March, 1637, he and his friend watched an occultation of the Pleiades by the Moon, and they noticed that as the stars approached the dark limb each vanished instantaneously. From this phenomenon Horrox was the first to *remark that the apparent diameters of the stars must be extremely small, indeed that they must be mere points.*

It is surprising that one so young, and with such poor equipment, could not only observe with accuracy, but could draw such remarkable deductions from the facts he discovered.

The continued use of the writings of Tycho and Kepler afforded him on the one hand much gratification, and on the other an incentive to renewed application. These great masters had devoted much time to the motions of the moon. Tycho had discovered its third inequality, *the Variation*, and its fourth, *the Annual Equation:* the latter was discovered independently by Kepler. In his calendar for 1598, Kepler stated that the solar eclipse of that year would be total. It turned out, however, that not only was it not total, but that it was an hour and a half later than he predicted. On thinking over these discrepancies and trying to account for them, he suggested that the moon might be retarded in its motion by a force emanating from the sun which would be greatest at perihelion, when the earth and the moon would be nearer the sun than they were at aphelion. He afterwards, however, rejected this theory. Horrox pondered over these theories and discoveries. He corrected the Annual Equation to 11′ 16″ which is only 4″ more than it is now known to be. Tycho made it 4′ 5″

only. He closely observed the motions of the moon, and tried to find an explanation of its marvellously intricate orbit and the inequalities of its longitude. His intense reasoning powers were concentrated on these phenomena until at last he was able to unravel the tangled skein of the moon's orbit. Kepler had found that Mars, the Earth, and other planets moved in elliptic orbits; but the solution of the shape of the moon's orbit had puzzled him. To this young philosopher was left the glory of the discovery that the moon too moved in an elliptic orbit, with the earth in one of its foci; and that its apsides had a considerable progressive motion which he attributed to the *disturbing influence of the sun*. It was this movement of the apsides which, to a great extent, concealed the shape of its orbit. From this discovery his sagacity led him to an explanation of the second inequality, *the Evection*, which, he pointed out, depended upon the position of the apsides with regard to the position of the sun and the earth.

These discoveries alone entitle him to a niche in the Temple of Fame. But he was yet destined to give to the world thoughts which were to fall as seed in the minds of others, to germinate and in time to bear a glorious harvest.

Many vague and fanciful theories of a magnetic or attractive influence issuing from the sun which acted upon the planets, and upon the earth and the moon, had been held by philosophers from an early period. Kepler announced the principle of gravitation, but could not explain why the attracting bodies always kept apart; why they did not approach nearer to one another and ultimately unite. He tried to overcome the difficulty by saying that the sun rotated from west to east and threw out magnetic fibres which drew the planet in a direction transverse to the line joining it and the sun. Recognising the weakness of his theory, he tried to fortify it by adding "So is the will of God."

In searching into the cause of these curvilinear orbits, it is convenient to think of the motion of the planet or satellite as the resultant of two motions, the one by

which the body has an original motion of its own, and the other by which it is drawn towards its centre of gravity. Horrox was the first to conceive this idea. He wrote to his friend Crabtree that he had been meditating upon the principle by which planets moved in oval orbits. He rehearsed Kepler's theories, and said that these would not satisfy him. "It is most true that the will of God is the cause of all things, but resting on generalities is the death of philosophy. I must have another cause for that oval figure. It appears to me, however, that I have fallen upon the true theory, and that it admits of being illustrated by means of natural movements on the surface of the earth, for Nature everywhere acts according to a uniform plan, and the harmony of creation is such that small things constitute a faithful type of greater things. A weight is thrown into the air: at first it rises quickly, then moves slowly, until at length it is stationary and falls back to the earth with a velocity which continually increases. It thus describes a libratory movement. This movement arises from the impetus in a right line which has been imparted to it by your hand together with the magnetic influence of the earth." He further illustrated the movements of the planets by showing that if a weight suspended by a long cord from a fixed point be drawn aside, and whilst it is released, a tangential impulse be given to it, it will not only describe an ellipse, but its apsides will advance slowly in the direction of its motion. By thus appealing to the smaller things in nature he was able to interpret the mystery of the greater things. He was able to show how a planet preserved its elliptic orbit, how its apsides moved, and in the case of the lunar orbit how the apsides moved so rapidly by the disturbing influence of the sun. Thus he became the forerunner of Newton. He rendered that great genius material help in the establishment of his laws of gravitation, and Newton in return erected an everlasting memorial to the genius of the poor curate of Hoole, by preserving his name to all generations in his monumental work, the Principia.

In June, 1638, he had the joy of communing in person

with his friend and "second self" by visiting him at Broughton. On the 22nd of May, 1639, he observed most clearly an eclipse of the sun through his telescope.

In June of that year he went to Hoole, where he had accepted duty as curate at a stipend of £40 per annum. There, although he had "daily harassing duties" and little leisure, he calculated the positions of the planets from tables drawn up by himself, and late in the autumn he found that, contrary to the predictions of Kepler and Lansberg, Venus in its conjunction *would* cross the disc of the sun. On 26th October he advised Crabtree of the transit which would take place on the 24th November, and begged him most earnestly to use his telescope with attention, and especially to note the diameter of Venus which, according to Kepler, was 7′, according to Lansberg 11′, but, according to his estimate, scarcely greater than 1′. He now carefully prepared for what he called the "Uranian banquet". Following the plan adopted by Gassendi in viewing the transit of Mercury eight years previously, he fitted up his telescope so that in a darkened room he could receive the sun's rays through it, and project the image of the sun on a sheet of paper. This paper he prepared by drawing upon it a circle of nearly six inches diameter. The circumference he divided into 360°, and the diameter into thirty equal parts. He carefully focussed his glass, and arranged the distance of his paper so that the sun's image should exactly fill the circle. He now awaited the event with eager expectancy. The memorable day arrived, but unfortunately, as it happened to be a Sunday, he could observe only between the intervals of his services. "I watched carefully," he says, "from sunrise till nine o'clock, and from a little before ten till noon, and at one in the afternoon, being called away in the intervals to business of the highest importance, which for the sake of these ornamental pursuits I could not with propriety neglect." After the usual two hours service in the afternoon, at a quarter past three, he hastened from church to his darkened room. There he nervously and anxiously moved his telescope and the graduated circle into the

path of the sun's rays. "At this time" he writes "an opening in the clouds, which rendered the sun distinctly visible, seemed as if Divine providence encouraged my aspirations, when, oh, most grateful spectacle! the realization of so many ardent desires! (ecce gratissimum spectaculum et tot votorum materiem!) I perceived a new spot* of unusual magnitude and of perfectly round form that had just wholly entered upon the left limb of of the sun, so that the margins of the sun and of the spot coincided with each other, forming an angle of contact. I immediately lost all doubt that this was the shadow of Venus, and applied myself to the careful observation of it.' He had only half-an-hour to do so, for the sun set at 3-50, but he made good use of his limited time. He found by means of the graduations on his circle that the planet had entered the eastern limb of the sun at 62° 30′ from the southern point of the vertical diameter. He carefully watched its progress, and at 3-35 and at 3-45 he estimated the distance of its centre from that of the sun. By means of the divided diameter of his circle he very accurately estimated the diameter of Venus not to exceed 1′ 12″.† At Manchester, unfortunately, clouds prevailed, and Crabtree, although permitted to see the transit, was so transfixed with joy and amazement at the wonderful sight, that before he could recover himself clouds again obscured the spectacle.

So it happened that these two young friends had the privilege of viewing a phenomenon which had never before been seen by man, and a recurrence of which could not again take place until after a lapse of 122 years.

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* He had for two or three days been watching a group of sun spots.

† The house pointed out by tradition as the house in which Horrox lived whilst at Hoole is Carr House, about half a mile south of the church, a quaint and solidly built edifice of brick and stone, with projecting porch and gable facing the south. The late Rev. R. Brickel was of the opinion that the centre room on the first floor, with the recessed window over the porch, was that in which Horrox saw the transit.



CARR HOUSE, MUCH HOOLE.

In an ode apostrophising the departing sun with Venus, the "beauteous Queen," Horrox wrote:—

"Thy return
Posterity shall witness; years must roll
Away, but then at length the splendid sight
Again shall greet our distant children's eyes."

During the remainder of his stay at Hoole he was engaged in writing an account of the transit under the title "Venus in sole visa."

About July, 1640, he returned home probably on account of ill health. From there he wrote to Crabtree of the uncertainty of his affairs, of harassments and "perpetual annoyances." In the midst of these troubles, however, he began a systematic study of the tides, and told his friend that he had gathered many interesting facts which had not before been noticed, and that he hoped before long to arrive at some valuable conclusions respecting their nature and cause. Unfortunately, all his papers regarding these investigations were lost.

Later in the year he wrote that he would long since have "hastened" to his friend but that he was prevented by a "great necessity." In December, he thinks he might be able to visit him at Christmas, and in his last letter, dated 19th December, 1640, he says that he could at length fix Monday, 4th January, 1641, as the day of his visit, and that he might expect him on that day "if nothing unforseen should occur." Alas! that meeting to which both had looked forward with exquisite delight was destined never to take place, for Horrox died suddenly on 3rd January, the day before his intended visit. He had only entered the 23rd year of his age. Crabtree felt the loss of his friend acutely, and on the back of this letter, after recording his loss, added, "Thus God puts an end to all worldly affairs. I have lost, alas! my most dear Horrox. Hinc illæ lachrimæ! Irreparable loss!"

In meditating on the scientific career of Horrox, the span of which could scarcely have measured eight years, we are amazed that he attained such eminence. He was burdened with poverty and ill health, dispirited for

want of sympathy and companionship, hindered for lack of books, crippled for want of implements, and he went astray because he had no one to help him. But his patient persistence, his courage, his self-reliance, and his great genius overcame these obstacles. Step by step he steadily trudged on his rugged way towards a land which was revealed to him as being full of promise, but which he was not to be permitted to enter. He knew the richness of that land, but like Moses he could only view the fair expanse from afar. The height he reached has been gauged by Robert Grant in his History of Physical Astronomy: "He (Horrox) unquestionably arrived at a greater appreciation of Kepler's discoveries than any of the successors of that great astronomer had hitherto done; while the sagacity and originality of his views on various points relating to Astronomy, his fertile and glowing imagination, and his ardent enthusiasm in the pursuit of science, all seemed to foreshadow a career of uncommon brilliancy, which a premature death unfortunately soon brought to a close. Even his brief labours, however, have assured to him a reputation which will live imperishably in the annals of science. By his own countrymen he cannot fail to be regarded with peculiar interest, as the morning star of a galaxy of men of genius, who continued for about a century to adorn these isles by their successful cultivation of the Physico-Mathematical Sciences."

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